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PHYCOLOGIA BRITANNICA:

OR,

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

BY

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IN FOUR VOLUMES.

VOL. II.

RHODOSPERMEÆ, OR RED SEA-WEEDS:

PART I.

(*Rhodomelaceæ, Laurenciaceæ, Corallinaceæ, Delesseriaceæ, and Rhodymeniaceæ.*)

SYNOPSIS, No. 98 to 189.

LONDON:
REEVE AND BENHAM,
HENRIETTA STREET, COVENT GARDEN.

1846–51.

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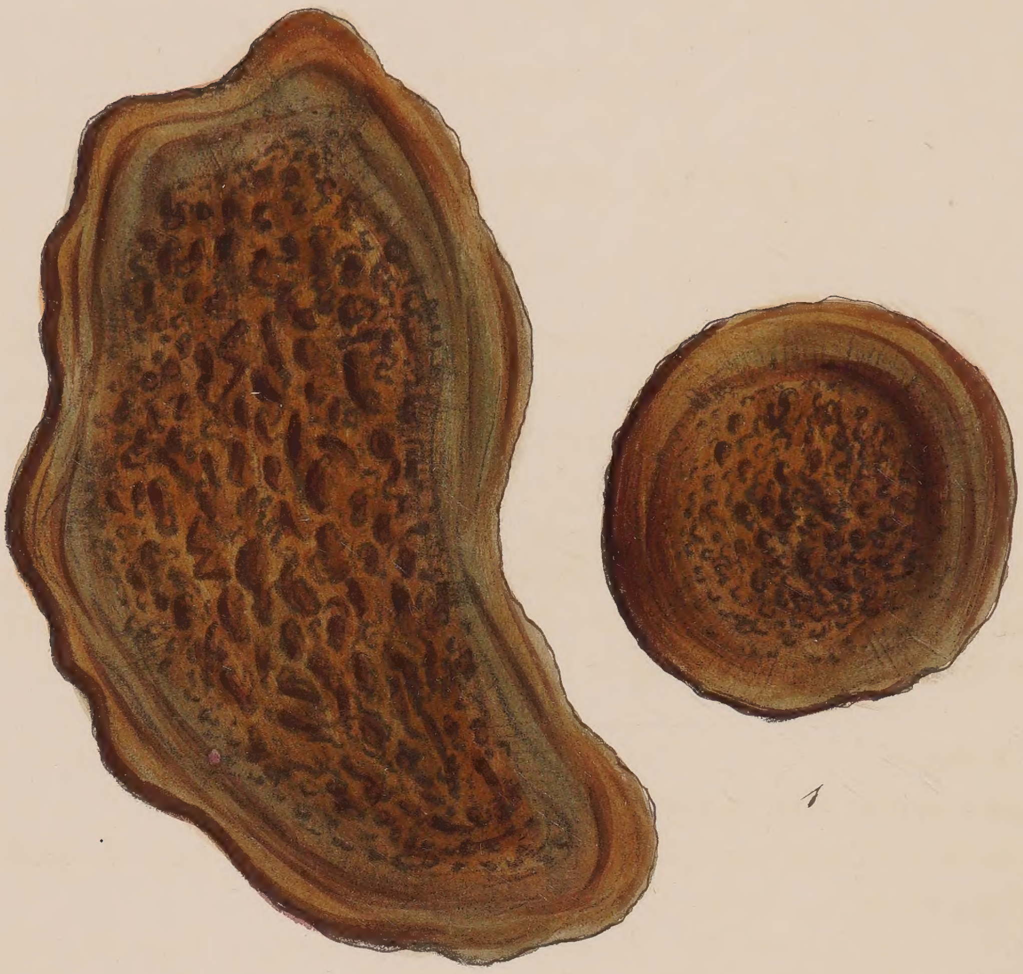

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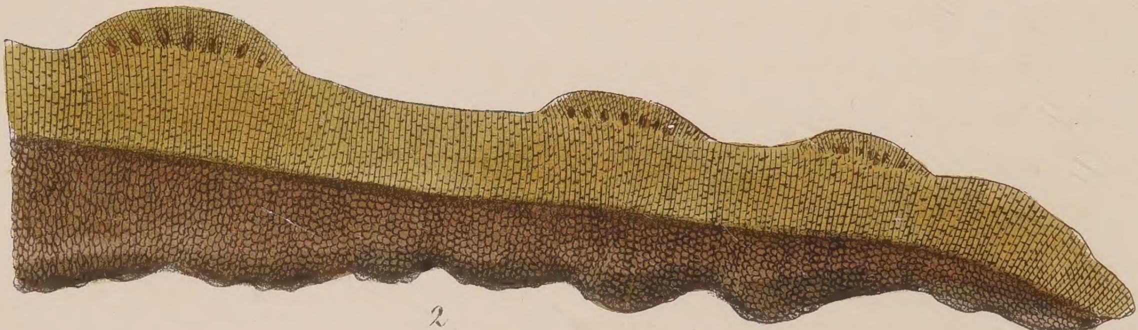

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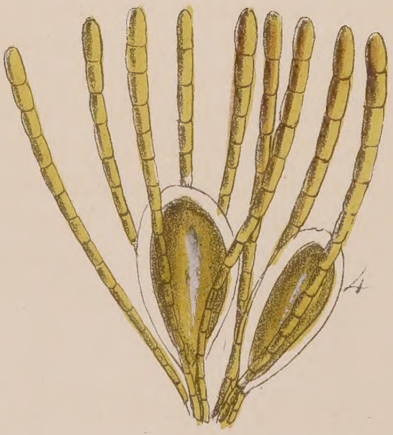

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W. H. H. del. et lith.

Reeve imp.

PLATE XCVIII.

RALFSIA DEUSTA, *Berk.*

GEN. CHAR. *Frond* coriaceo-crustaceous, fixed by its inferior surface, orbicular, concentrically zoned; composed of densely packed, vertical, simple filaments. *Fructification*; depressed warts, scattered over the upper surface, containing obovate spores fixed to the bases of vertical filaments. RALFSIA (*Berk.*),—in honour of *John Ralfs, Esq.*, of Penzance, a most acute and accurate botanist, whose discoveries among the minute Algæ, especially the *Diatomaceæ*, have thrown great light on that little known branch of botany.

RALFSIA *deusta*.

RALFSIA deusta, *Berk. in Eng. Bot. Suppl.* t. 2866.

HILDENBRANDTIA rubra, *Endl.* 3rd *Suppl.* p. 26 (*nec. syn. Berk.*; *nec. Menegh.*).

CRUORIA verrucosa, *Aresch.*

PADINA ? deusta, *Hook. Br. Fl.* vol. ii. p. 281. *Harv. in Mack. Fl. Hib.* part 3. p. 178. *Harv. Man.* p. 31.

ZONARIA ? deusta, *Ag. Syn.* p. 40. *Ag. Sp. Alg.* vol. i. p. 132. *Ag. Syst.* p. 265. *Lyngb. Hyd. Dan.* p. 19. t. 5.

FUCUS fungularis, *Oeder. Fl. Norv.* vol. ii. p. 107. *Fl. Dan.* t. 420 (*excl. syn. Imperati.*).

HAB. Common on the rocky shores of the British Islands, between high-water mark, and half-tide level; from Orkney to Devonshire. Perennial. Winter.

GEOGR. DISTR. Atlantic shores of Europe from Iceland to France. Baltic Sea, *Aresch.* Kamtschatka and Unalascha, *Tilesius.*

DESCR. *Fronds* spreading over the surface of rocks in crustaceous, lichenoid patches, from one to six or more inches in diameter; when young, orbicular, but becoming very irregular in outline when old, marked, more or less evidently, especially towards the margin, with concentric striæ or bands, about a line asunder. The surface of the frond in young specimens is nearly flat and even, but in full grown individuals it is much corrugated, and covered more or less with wart-like prominences; and very old plants present an exceedingly rugged surface, in which all traces of concentric striæ are lost. The structure of the frond is very dense and opake, but thin, vertical slices exhibit an arrangement of the cellules into vertical closly packed filaments, strongly glued together. The *fructification* consists of scattered warts, composed of vertical, easily separable filaments, to whose bases are attached obovate, simple spores. *Colour* a dark, coffee-brown, becoming darker in drying. *Substance* between leathery and crustaceous, flexible.

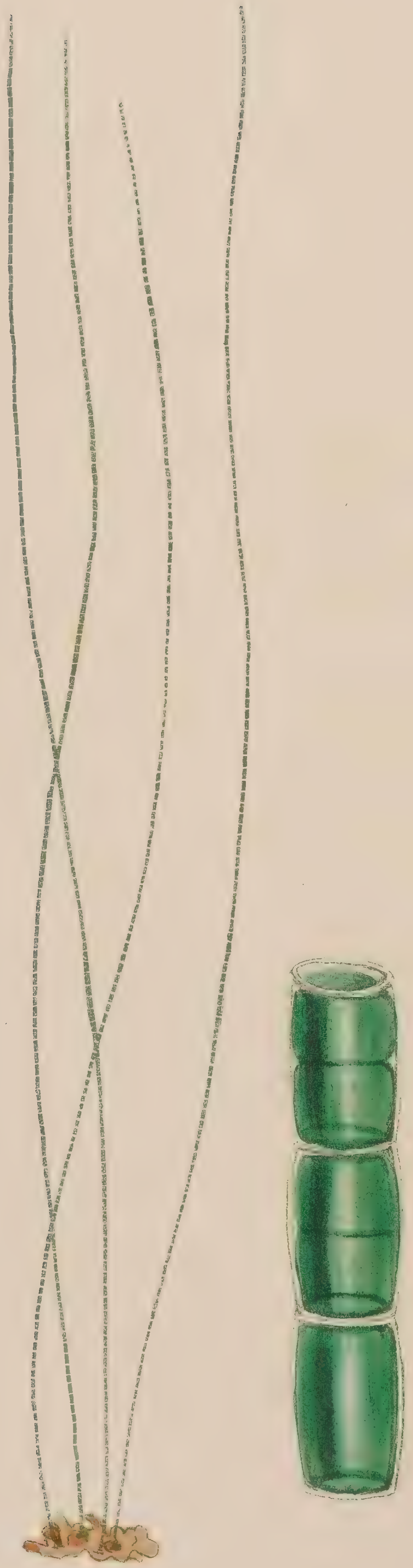
This singular production more nearly resembles, to the naked eye, a crustaceous Lichen, than an Alga, but its structure and fructification prove it to be widely different from any Lichen. There is a curiously close resemblance, both in the habit, the structure of the frond, and the outward character of its fruit, between *Ralfsia* and *Peysonellia*; yet, according to the received notions of arrangement, these plants must be referred to opposite parts of the system. They are, however, closely analogical forms, in the families to which they respectively belong. Except for the colour, and the different formation of the spores, there would be little to distinguished them.

Ralfsia deusta is a very common species throughout the Northern Atlantic Ocean, and probably extends along most of the shores of Europe, North Asia, and North America; though not yet recorded from the latter. Its crustaceous habit may often cause it to be over-looked.

Endlicher has confounded it with the very different *Hildenbrandtia rubra* (which is also common on the British coast); and Areschoug has, still more unhappily, put it into the same genus as *Cruoria pellita*, with which, in structure, it has very little connection. The resemblance between these is purely external.

The fructification of *Ralfsia* is either very rarely produced, or so difficult to find, owing to its obscurity, that it is rarely seen. It was first observed, I believe, by Dr. Johnston, who communicated the specimens to Mr. Berkeley, by whom they were described. Though myself familiar with this plant for many years, I had never seen the fruit, until I received fertile specimens from Dr. Dickie of Aberdeen, and from these I have made my analysis. On the west coast of Scotland and of Ireland this plant is excessively abundant, and its patches reach a large size. Devonshire specimens, communicated by the Rev. Mr. Cresswell, are much inferior.

Fig. 1. RALFSIA DEUSTA, young and old fronds:—*of the natural size.* 2. Vertical section of the frond. 3. Filaments of which the frond is composed. 4. Spores, among the filaments of a wart. 5. A spore and its filaments, separated:—*all more or less highly magnified.*



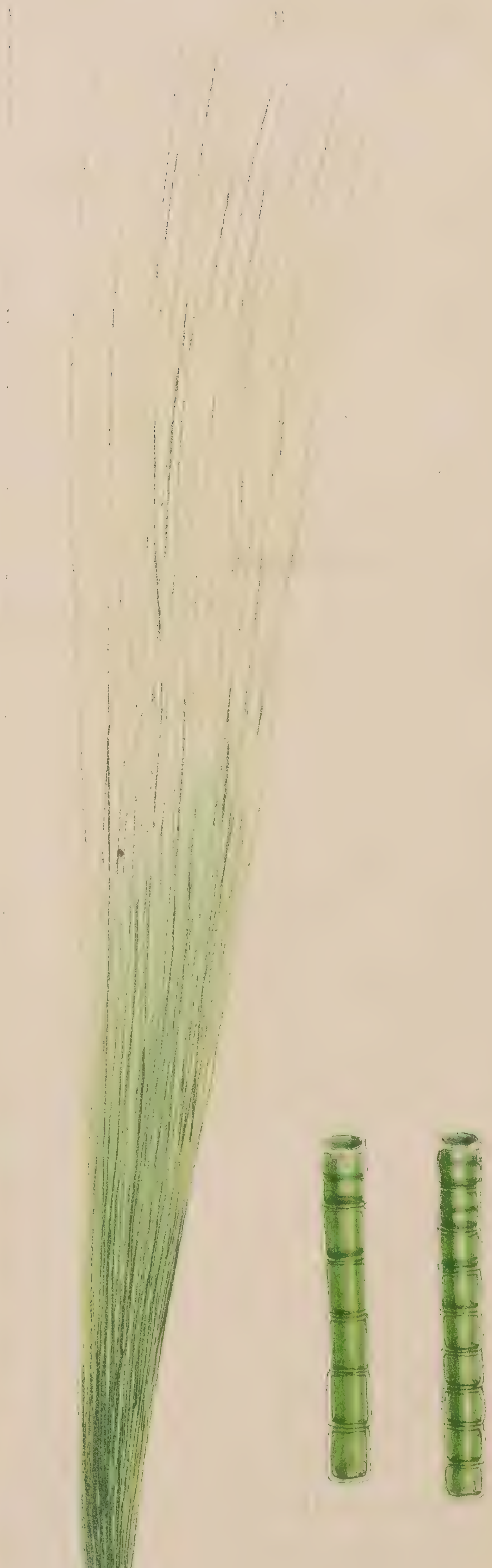


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PLATE XCIX. *A.*

CONFERVA MELAGONIUM, *Web. et Mohr.*

GEN. CHAR. *Filaments* green, jointed, attached or floating, unbranched. *Fruit,* aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CONFERVA (*Plin.*)—from *conferruminare,* to *consolidate*; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *Melagonium*; root scutate, filaments elongated, robust, scattered or slightly tufted, erect, stiff and wiry, dark-green; joints twice as long as broad.

CONFERVA Melagonium, *Web. et Mohr. It. Suec.* p. 194. t. 3. f. 2. *a, b. Roth, Cat. Bot.* vol. iii. p. 254. *Dillw. Int.* p. 48. *Suppl.* t. B. *Ag. Syn.* p. 84. *Lyngb. Hyd. Dan.* p. 148. t. 51. *Ag. Syst.* p. 99. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part 3. p. 226. *Harv. Man.* p. 130. *Wyatt, Alg. Danm.* no. 221. *Kütz. Phyc. Gen.* p. 260.

HAB. On the rocky bottoms of deep tide pools, near low-water mark. Perennial. Found on many parts of the British coasts, from Orkney to Cornwall, and on all the coasts of Ireland; but nowhere very abundant. Jersey, *Miss White.*

GEOGR. DISTR. Throughout the Northern and German Ocean. Iceland. Greenland. Shores of North America; Boston Bay, *Dr. A. Gray.*

DESCR. *Root* scutate. *Filaments* five to twelve inches long or more, twice or thrice as thick as hog's bristles, erect, stiff, and very tough, straight, of equal diameter throughout, rarely tufted, generally growing in a scattered manner, or in small clusters of four or five, of a very dark green colour. *Articulations,* except the basal one, which is short, about twice as long as broad, filled with a dark green mass, which at length separates into two portions. *Dissepiments* contracted, very narrow, pellucid.

This species is widely dispersed throughout the Northern Atlantic, from the shores of Greenland to those of Britain, and extends along the shores of North America, as far as Boston, and perhaps further southward. It is abundantly distinguished from all British species by the great diameter and rigidity of its filaments, which stand erect, if the water be removed from them; but it seldom grows in places where it is left exposed on the recess of the tide. Its nearest affinity is with *C. ærea,* which I have therefore represented on the same plate; but it is a much more rigid plant.

A. Fig. 1. Conferva Melagonium; some filaments:—*of the natural size.* 2. Portion of a filament:—*magnified.*

Plate XCIX. *B.*

CONFERVA ÆREA, *Dillw.*

Conferva *ærea*; root scutate, filaments elongated, setaceous, tufted, straight, harsh, brittle, yellow-green; articulations about as long as broad.

Conferva ærea, *Dillw. Conf.* t. 80. *E. Bot.* t. 1929. *Lyngb. Hyd. Dan.* p. 147. t. 51. *Ag. Syst.* p. 100. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part 3. p. 226. *Harv. Man.* p. 130. *Wyatt, Alg. Danm.* no. 191. *Mont. Canar.* p. 184. *J. Ag. Alg. Medit.* p. 12. *Kütz. Phyc. Gen.* p. 258.

Conferva antennina. *Bory, Dict. Class.* t. 4. p. 392.

Hab. On sand-covered rocks, between tide marks. Frequent in many places.

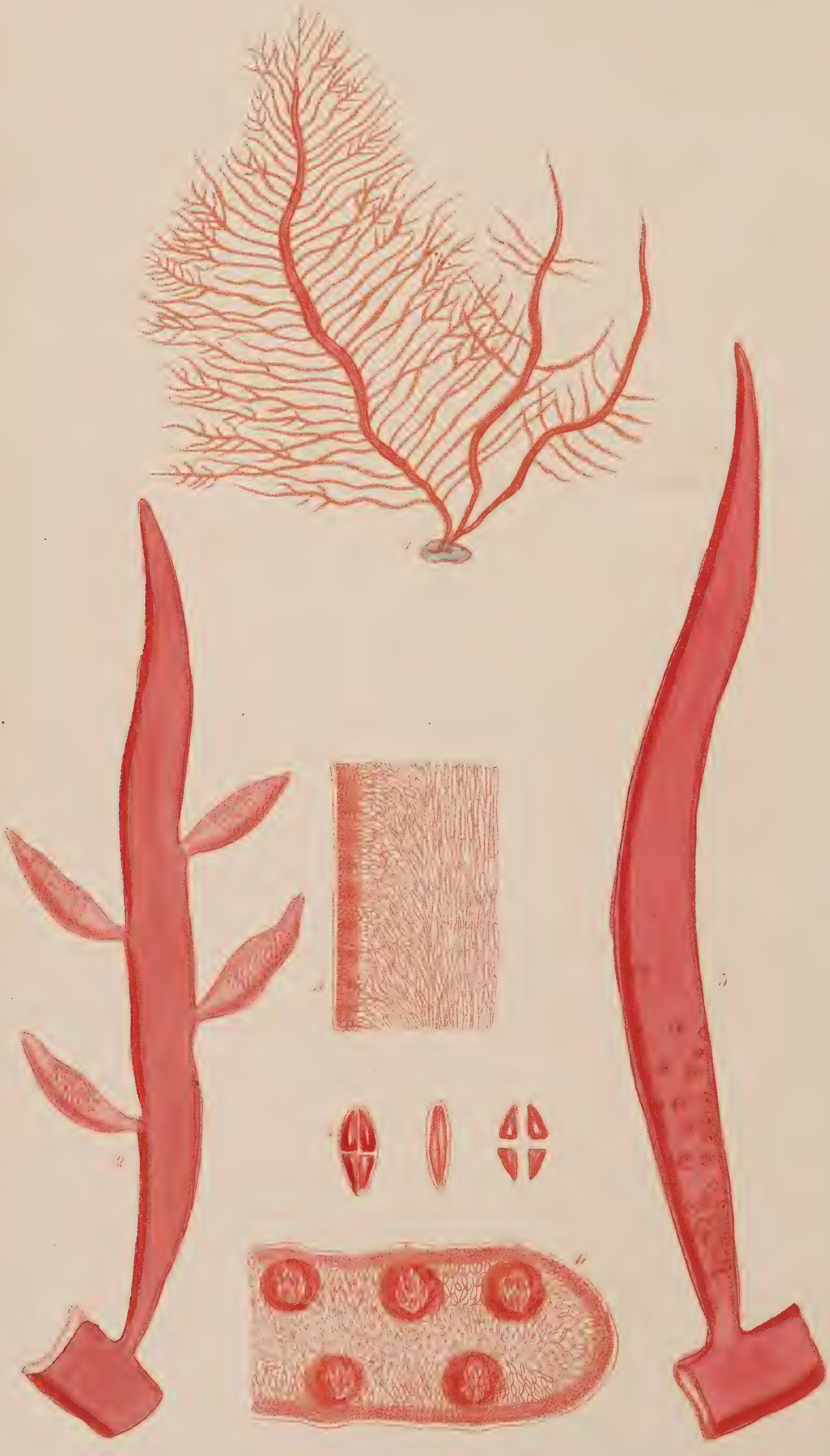
Geogr. Distr. Found on all the Atlantic coasts of Europe; also in the Mediterranean. Canary Islands.

Descr. *Filaments* attached by a scutate base, three to twelve inches in length, as thick as bristles, harsh to the touch, but much less rigid than *C. Melagonium*, straight, densely tufted, of a beautiful yellow-green colour, which fades, in the Herbarium, to a greenish-white. *Articulations* about as long as broad, or a little longer, their contents at length separating into two portions. *Dissepiments* slightly contracted.

* * *

This is one of the many species of *Conferva* first brought to the notice of botanists in the excellent monograph of Dillwyn, where a correct figure is given of it. It appears to be generally diffused throughout the Atlantic, extending even within the tropics. It is always a more tufted plant than *C. Melagonium*, paler in colour, of scarcely half the diameter, and, though harsh, far less rigid and quite unable to support itself when removed from the water.

B. Fig. 1. Conferva ærea; a tuft:—*of the natural size.* 2. Portion of different filaments:—*magnified.*



W. H. H. del. et lith.

PLATE C.

GRATELOUPIA FILICINA, *Ag.*

GEN. CHAR. *Frond* flat, more or less pinnate, membranaceous, flexible, solid, composed of densely interwoven, anastomosing, branching filaments; those of the periphery moniliform, short and very strongly compacted together. *Fructification*; 1, globular masses of spores (*favellidia*) immersed beneath the peripheric stratum, and communicating with the surface by a pore; 2, cruciate *tetraspores* vertically placed among the filaments of the periphery, in sub-defined sori.—GRATELOUPIA (*Ag.*), in honour of *Dr. Grateloup*, a French Algologist.

GRATELOUPIA *filicina*; frond linear, narrow, tapering to either extremity, irregularly once or twice pinnated; pinnæ flexuous, patent, contracted at the base and attenuated towards the apex.

GRATELOUPIA filicina, *Ag. Sp. Alg.* vol. i. p. 224. *Syst.* p. 241. *Spreng. Syst. Veg.* vol. iv. p. 334. *Grev. Alg. Brit.* p. 151. t. 16. *Hook. Br. Fl.* vol. ii. p. 306. *Wyatt, Alg. Danm.* no. 123. *Harv. Man.* p. 83. *J. Ag. Medit.* p. 103. *Endl. 3rd Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 397. *Mont. Fl. Alger.*

GRATELOUPIA porracea, *Kütz. Phyc. Gen.* p. 397.

DELESSERIA filicina, *Lamour. Ess.* p. 38.

GELIDIUM neglectum, *Bory, Fl. Pelop.* p.

FUCUS filicinus, *Wulf. in Jacq. Coll.* vol. iii. p. 157. t. 15. f. 2. *Turn. Hist. Fuc.* t. 150. *Esper, Ic. Fuc.* vol. i. p. 134. t. 67.

HAB. On submarine rocks at half-tide level, frequently where small streamlets run into the sea. Very rare. Perennial. Winter. Sidmouth and Ilfracombe, *Miss Cutler*. Barrowcane and Hagington, *Mrs. Griffiths*. Mount's Bay, Cornwall, plentiful, and at Aberystwith, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic shores of France and Spain. Abundant in the Mediterranean. Cape of Good Hope. Indian Ocean.

DESCR. *Fronds* rising from a scutate base, tufted, seldom (in British specimens) more than two inches high, but, in warmer countries, reaching 8–10 inches in length, from half a line to a line in breadth, flexuous, flat, undivided or once or twice irregularly forked, sometimes nearly bare or with a few lateral branches, but more frequently closely pinnated with more or less regularity. *Pinnæ* opposite or alternate, patent, distichous, flexuous, tapering to a fine point, narrowed at the base, simple, often pinnulated toward the apex, the pinnulæ sometimes irregularly forked. *Tubercles* (*favellidia*) crowded toward the base of the pinnæ, in whose substance they are deeply imbedded, communicating with the surface by means of a pore, containing a mass of densely compacted spores. *Tetraspores* thickly scattered among the surface cells of accessory leaflets or pinnules, vertical, cruciately divided. *Substance* cartilagineo-membranaceous, soft, but very tough. *Colour* a dull brownish red.

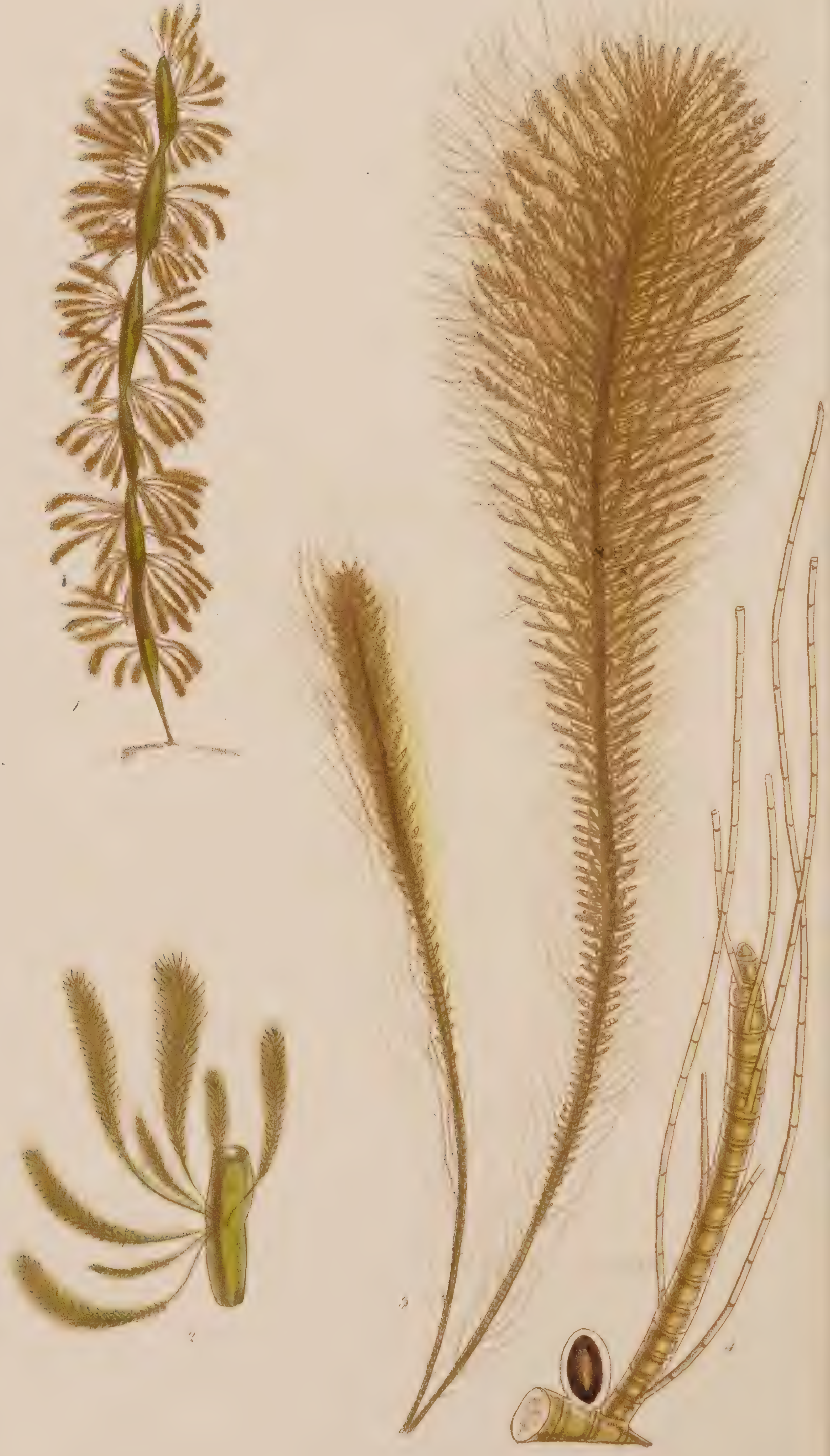
The genus *Grateloupia* contains several species, all of which are natives of the warmer parts of the temperate zone, about lat. 34° to 40°. *G. filicina* is the only one which has a very wide distribution, and it extends from the tropical ocean to the southern shores of Britain, where it becomes very much dwarfed in size, but where, nevertheless, it frequently produces fruit of both kinds. In the Mediterranean Sea, where it is common, the fronds are six or eight inches in expansion, and regularly and closely bipinnate, the pinnules an inch or more in length. Specimens from the Indian Ocean are very similar. Those from the Cape of Good Hope, while they are quite as long, have a much narrower outline, with shorter pinnæ and pinnulæ.

The only British plant with which this is likely to be confounded, is *Gelidium corneum*, to some varieties of which, especially that which I have called *flexuosum* (Pl. LIII. Fig. 2), it bears a very strong external resemblance. Its softer and more membranous substance will generally distinguish it to the feel; and the microscope will point out a difference of structure, when closely examined. If in a state of fruit, there can be no difficulty in discriminating between them.

The discoverer of *G. filicina* in Britain was Miss Cutler of Sidmouth, and the earliest notice of its occurrence appeared in Dr. Greville's 'Algæ Britannicæ'. It is still a desideratum in the flora of Ireland and of Scotland, but the chances of its being met with in the latter country are very feeble.

Fig. 1. GRATELOUPIA FILICINA :—*the natural size.* 2. A pinna with tetraspores in the accessory leaflets. 3. Vertical section of the same, showing the position of the tetraspores. 4. Tetraspores. 5. A pinna with tubercles. 6. Transverse section of the same :—*all more or less highly magnified.*

Pl. CI.



I.d.del et H

PLATE CI.

MYRIOTRICHIA CLAVÆFORMIS, *Harv.*

GEN. CHAR. *Filaments* capillary, flaccid, jointed (simple), beset with quadrifarious, simple, spine-like ramuli, clothed with byssoid fibres. *Fructification,* elliptical *utricles* (or spores?) containing a dark-coloured sporaceous mass. MYRIOTRICHIA (*Harv.*),—from μύριος, a *thousand,* and θρὶξ, a *hair.*

MYRIOTRICHIA *clavæformis;* stem densely beset with quadrifarious ramuli, which gradually increase in length from the base upwards, giving the frond a club-shaped figure.

MYRIOTRICHIA clavæformis, *Harv. in Hook. Journ. Bot.* vol. i. p. 300. t. 138. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Wyatt, Alg. Danm.* no. 131. *Harv. Man.* p. 44. *Endl. 3rd Suppl.* p. 24.

HAB. Parasitical on *Chorda lomentaria.* Annual. Summer. Bantry Bay, *Miss Hutchins.* Torquay, *Mrs. Griffiths.* Cable Island, near Youghal, *Miss Ball.* North of Ireland and Ballantræ, Ayrshire, *Mr. W. Thompson.* Howth and Balbriggan, *Miss Gower.* Mount's Bay, Cornwall, *Mr. Ralfs.* Falmouth, *Miss Warren.* Jersey, *Miss White.*

GEOGR. DISTR. British Islands.

DESCR. *Fronds* tufted, half an inch or rather more in length, flaccid, subgelatinous, simple, linear-clavate, dark olive brown, surrounded by colourless fibres. Primary thread articulated, bare of ramuli below for a short distance above the base, upwards densely beset with patent simple quadrifarious ramuli, the lowermost of which are very short or merely rudimentary, the uppermost gradually longer and those toward the apex frequently producing, in old specimens, a second series near their tips. From the apices and sides of the ramuli, and from the lower part of the stem, spring innumerable slender, byssoid, colourless, long-jointed fibres, which greatly increase the bulk of the plant, and impart to it the peculiar softness. Articulations of the stem and ramuli shorter than their breadth. *Utricles* elliptical, or somewhat ovate, sessile on the main threads, occupying the position of a ramulus, having a pellucid limbus and containing a dark-coloured sporaceous mass. *Colour* dark olivaceous brown.

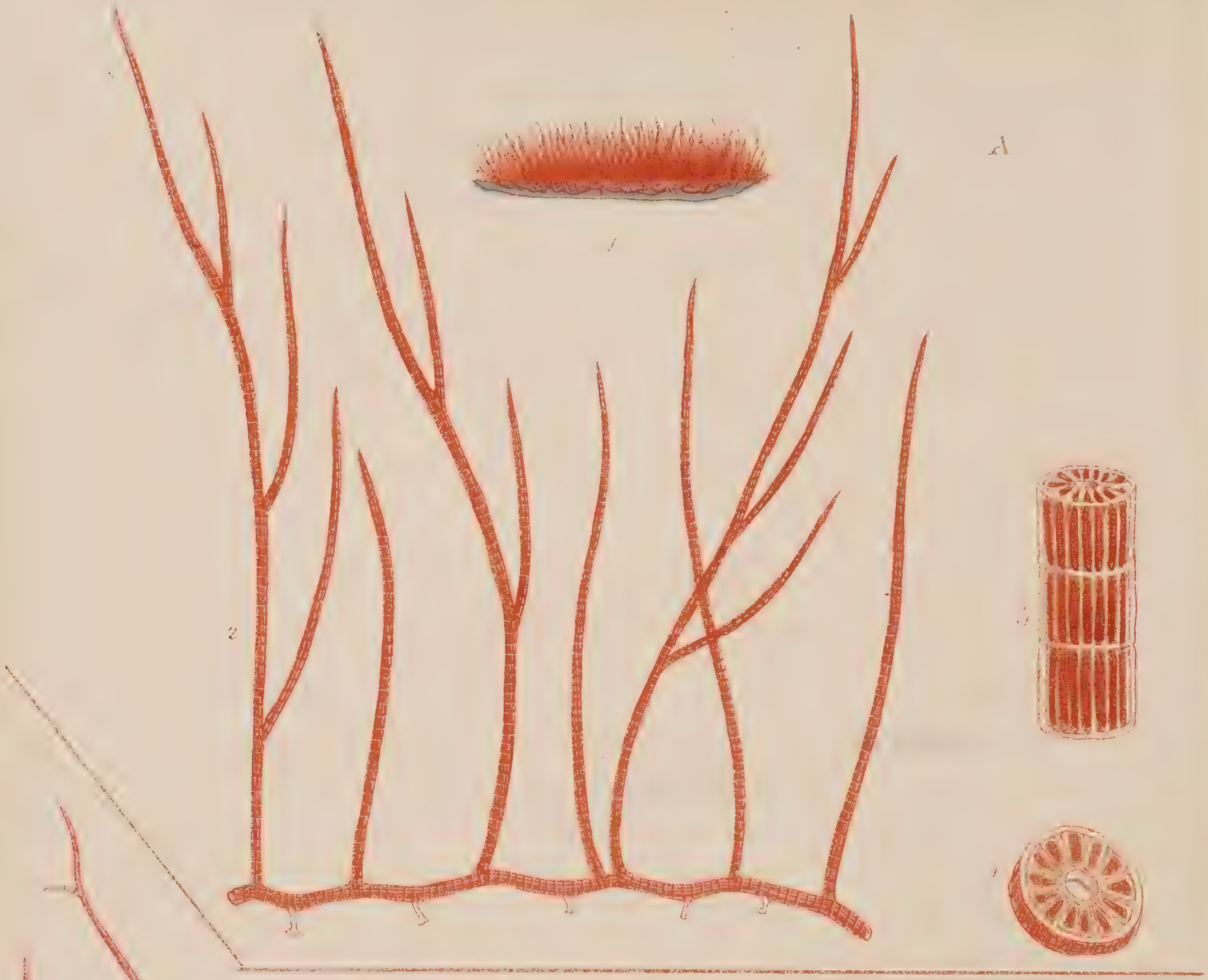
This curious little parasite, which, in some seasons, is not uncommon on the fronds of *Chorda lomentaria,* though far less common than the closely-allied *M. filiformis,* was discovered by Miss Hutchins about the year 1808, a circumstance unknown to me when, in 1834, I published it as a novelty in the 'Journal of Botany. To the majority of botanists it was then indeed new, for no notice had been taken of Miss Hutchins's specimens in 'Eng. Bot.'; and no other observer had collected the plant until Mrs. Griffiths, in 1833, gathered the specimens which were described by me.

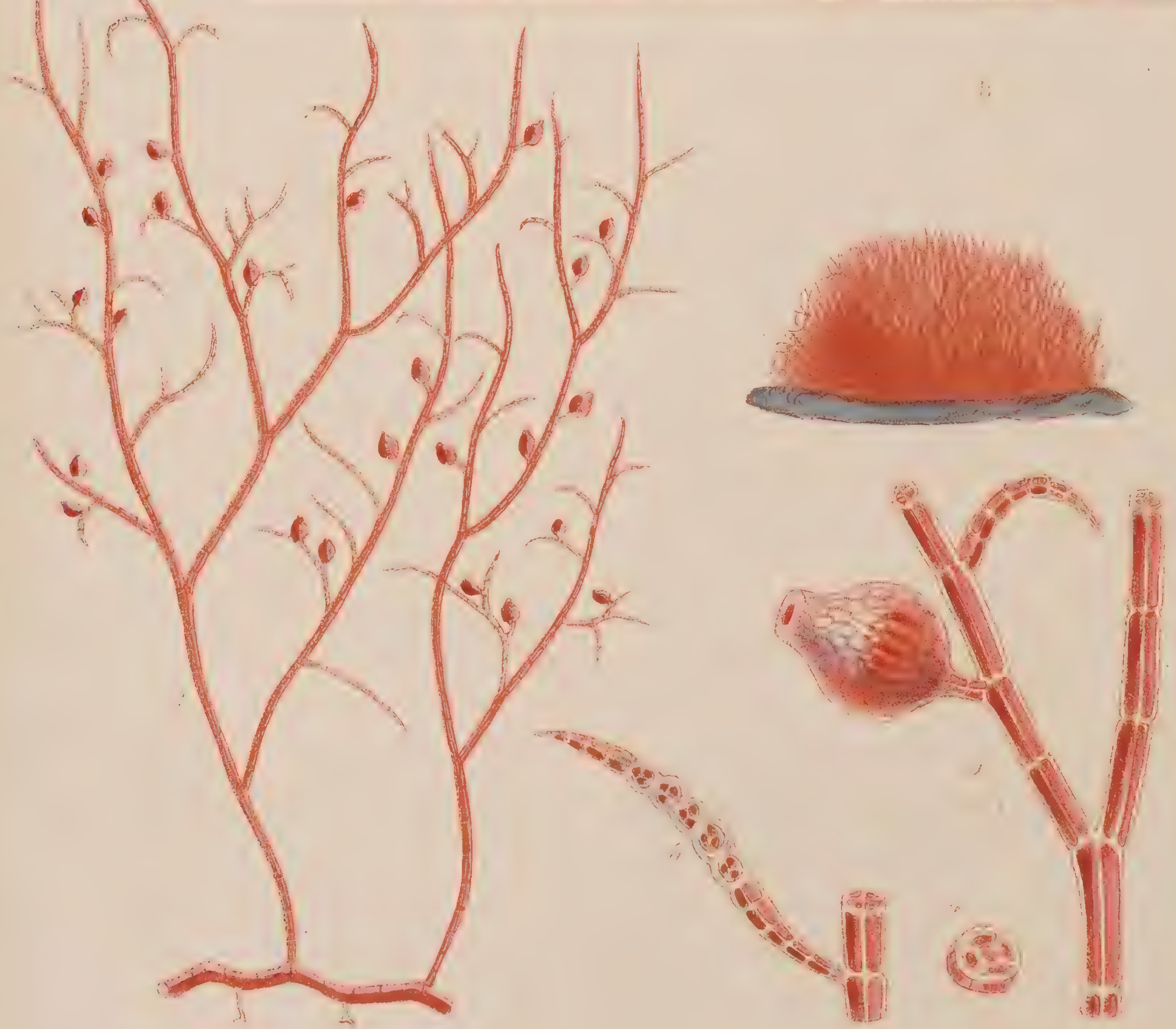
In the account which I first published respecting it, I regarded it as more nearly allied to *Ectocarpus* than to any other genus, an opinion to which I still adhere, although Endlicher has placed it nearer to *Cladostephus*, to which its quadrifarious ramuli bear some resemblance. In the long hyaline fibres which plentifully cloth it in every state, it is distinct from both. These *fibres* I formerly described as being forked; on a more careful examination I cannot detect this character. They appear to issue indiscriminately from the apices, and the lateral sides of the ramuli.

In the outline of the frond there is much resemblance to *Dasycladus clavæformis*, a curious Mediterranean Alga belonging to *Siphoneæ*; but the structure is very widely different.

Fig. 1. A frond of *Chorda lomentaria* infected with tufts of MYRIOTRICHIA CLAVÆFORMIS:—*the natural size.* 2. A tuft of *Myriotrichia clavæformis.* 3. Two fronds, of different ages. 4. A section showing a utricle, subtended by a ramulus, and some of the hairs which clothe the latter:—*all more or less magnified.*

Pl. CII





W. H. H. del et lith.

Reeve imp.

PLATE CII. *A.*

POLYSIPHONIA OBSCURA, *J. Ag.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a terminal pore, and containing a mass of pear-shaped spores. 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), from πολὺς, *many*, and σίφων, *a tube.*

POLYSIPHONIA *obscura*; densely matted together, filaments creeping, throwing up erect, simple, secund branches, which are either naked or furnished with a few secund ramuli; articulations as long as broad, many-tubed.

POLYSIPHONIA obscura, *J. Ag. Alg. Medit.* p. 123. *Endl. 3rd Suppl.* p. 44.

HUTCHINSIA obscura, *Ag. Sp.* vol. ii. p. 108.

CONFERVA intertexta, *Roth, Cat. Bot.* vol. i. p. 188. t. 3. f. 5. vol. ii. p. 214.

HAB. Spreading over marine rocks, at half-tide level; also parasitical on *Fuci*, and on some of the smaller Algæ. Jersey, *Miss White.* On the sheltered side of a lofty rock, near Sidmouth, *Rev. Mr. Cresswell.*

GEOGR. DISTR. Coast of Spain, at Cadiz, *Ag.* Adriatic Sea.

DESCR. Plant spreading over the surface of rocks, in patches of six inches to a foot in diameter, covering the roots of such *Fuci* as it may encounter. *Filaments* decumbent, attached by means of rooting processes, which issue at intervals from the lower surface, subsimple, throwing up from the upper surface erect, secund branches, from a quarter to half an inch in length, quite simple, and tapering to a fine point, naked, or furnished with three or four secund simple ramuli. *Articulations* visible in all parts of the frond, about as long as broad, or rather shorter, composed of twelve or thirteen radiating tubes. The fruit I have not seen on British specimens. *Colour*, dark brown-red. *Substance* rigid, imperfectly adhering to paper.

This interesting addition to the British Flora, was made by Miss White, who detected, in 1846, a single specimen growing among the roots of *P. fibrata*, at Jersey. More recently it has been gathered in great abundance by the Rev. Mr. Cresswell, in a station near Sidmouth, and to his kindness I am indebted for numerous specimens, gathered at various seasons.

I had, at first, confounded it with *P. secunda*, Mont., a plant to which, outwardly, it bears a strong resemblance, but from which it differs in the length, and composition of the articulations. I have now minutely compared the British specimens with one of *P. obscura*, received from Prof. J. Agardh, and find them to agree in all essential particulars; ours are, however, rather more robust than the Adriatic plant, and the joints slightly shorter.

A. Fig. 1. Polysiphonia obscura; part of a patch:—*of the natural size.* 2. Portion of a creeping filament:—*moderately magnified.* 3. Portion of a branch. 4. Cross section of the same:—*both highly magnified.*

Plate CII. *B.*

POLYSIPHONIA PULVINATA, *Spreng.*

Polysiphonia *pulvinata*; filaments rising from a mass of creeping fibres, tufted and interwoven, short, very slender, flexuous, sparingly and irregularly dichotomous, more or less furnished with very patent or recurved, simple ramuli; articulations of the main branches three or four times as long as broad, of the ramuli very short, four-tubed; capsules urn-shaped, stalked.

Polysiphonia pulvinata, *Spreng. Syst. Veg.* vol. iv. p. 350. *J. Ag. Alg. Medit.* p. 124. *Mont. Fl. Canar.* p. 172. *Endl. 3rd Suppl.* p. 44. *Harv. Man.* p. 94. *Wyatt, Alg. Danm.* no. 215.

Polysiphonia macrocarpa, *Harv. in Mack. Fl. Hib.* part 3. p. 296.

Hutchinsia pulvinata, *Ag. Sp. Alg.* vol. ii. p. 109.

Conferva pulvinata, *Roth. Cat.* vol. i. p. 187. t. 3. f. 4. vol. ii. p. 214.

Hab. On rocks in the sea, between tide marks. Annual. Not uncommon. Miltown Malbay, *W. H. H.* Port Stewart, *Mr. D. Moore.* Ilfracombe and Torbay, *Mrs. Griffiths.* Salcombe, Lands-End and Mount's Bay, *Mr. Ralfs.* Balbriggan, *Miss Gower.* Saltcoats, *Mr. D. Landsborough, Jun.* Ardrossan, *Major Martin.*

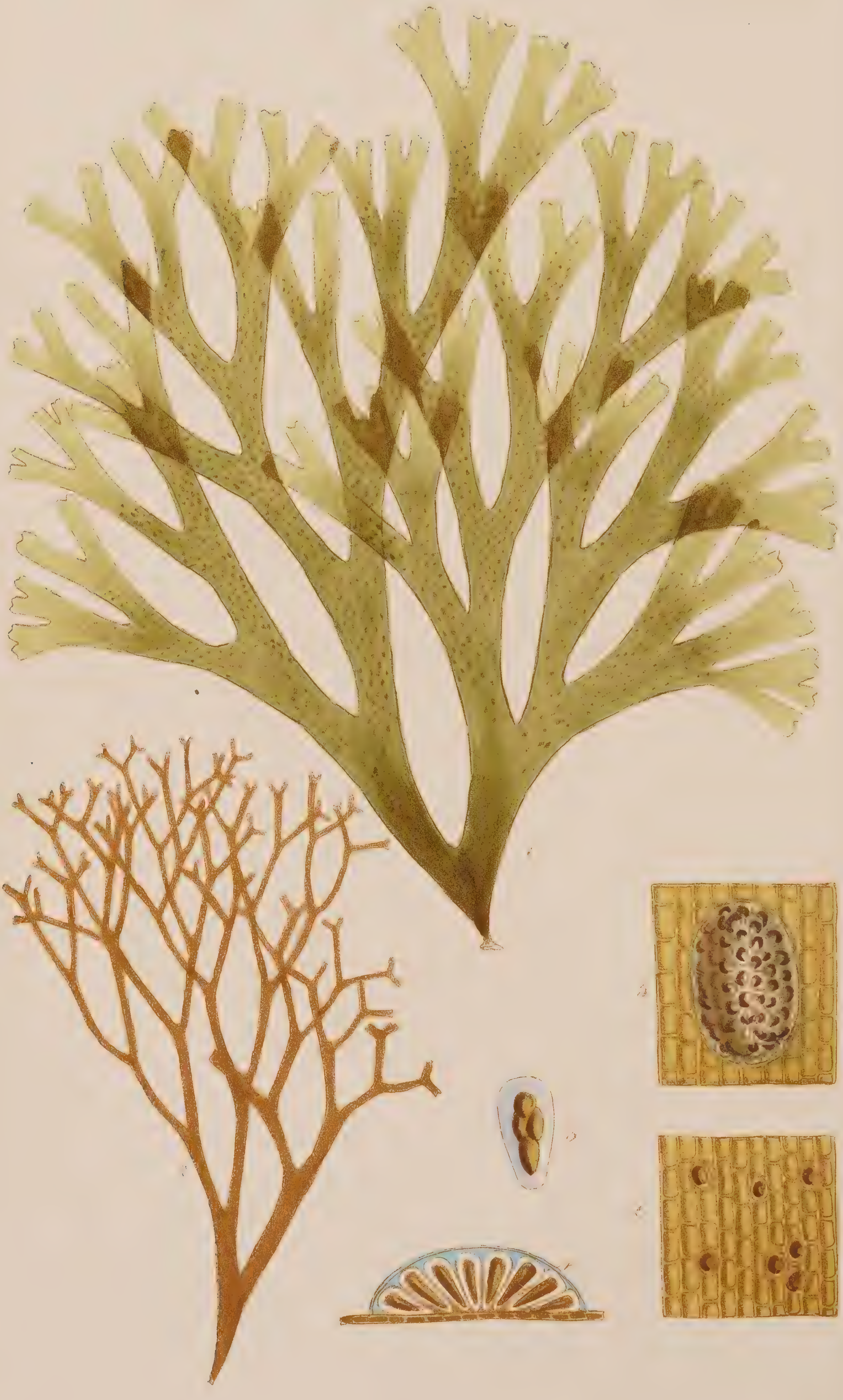
Geogr. Distr. Atlantic and Mediterranean coasts of Europe. Canary Islands.

Descr. *Filaments* rising from creeping fibres, densely aggregated in roundish, fastigiate tufts, about an inch in height, very slender and flaccid, flexuous, irregularly branched; branches more or less dichotomous, furnished irregularly with scattered, alternate or now and then secund, very patent, or divaricating, short ramuli, which are mostly simple, occasionally subdivided. *Articulations* variable in length; those of the main divisions three to four times, of the lesser branches twice or thrice, and of the ramuli half as long as broad, all marked with two broad, coloured bands, and composed of four tubes radiating round a central cavity. *Capsules* large in proportion to the diameter of the filaments from which they spring, urn-shaped, with a contracted orifice, borne on short lateral stalks. *Tetraspores* imbedded in the ramuli in a single row. *Colour* a dark red-brown. *Substance* soft and somewhat gelatinous, closely adhering to paper.

* * *

This resembles *P. urceolata* in miniature, but has the soft substance of *P. fibrata*, and is a much more slender plant.

B. Fig. 1. Polysiphonia pulvinata; a tuft:—*of the natural size.* 2. Portion of a filament:—*moderately magnified.* 3. A ramulus with *tetraspores.* 4. Portion of a branch, with capsule. 5. Transverse section of a branch: *all highly magnified.*



W. H. H. del et lith.

Reeve imp.

PLATE CIII.

DICTYOTA DICHOTOMA, *Lamour.*

GEN. CHAR. *Root* coated with woolly fibres. *Frond* flat, membranaceous, ribless, reticulate, dichotomous or irregularly cleft. *Fructification*, scattered clusters of spores formed beneath the cuticle, through which they finally burst; or, on distinct plants, solitary spores irregularly dispersed over the surface. DICTYOTA (*Lamx.*)—from δικτῦον, a *net*; because the surface is reticulated.

DICTYOTA *dichotoma*; frond regularly dichotomous, linear; segments cuneate at the base, erect or erecto-patent, gradually narrower towards the apices, axils rounded.

DICTYOTA *dichotoma, Lamour. Ess.* p. 58. *Grev. Alg. Brit.* p. 57. t. 10. *Hook. Br. Fl.* vol. ii. p. 280. *Harv. in Mack. Fl. Hib. part* 3. p. 177. *Wyatt. Alg. Danm.* No. 10. *Harv. Man.* p. 32. *Duby. Bot. Gall.* p. 954. *Menegh. Alg. Ital. and Dalm.* p. 224. *Endl. 3rd. Suppl.* p. 24. *Mont. Fl. Alg.* p. 30.

ZONARIA dichotoma, *Ag. Sp. Alg.* vol. i. p. 133. *Ag. Syst.* p. 266. *Hook. Fl. Scot.* vol. ii. p. 90. *Grev. Fl. Edin.* p. 297.

DICHOPHYLLIUM vulgare, *Kütz. Phyc. Gen.* p. 337. t. 22. II. f. 1–4.

DICHOPHYLLIUM dichotomum, *Kütz. l. c.* p. 338.

HALISERIS dichotoma, *Spreng. Syst. Veg.* vol. 4. p. 328.

ULVA dichotoma, *Huds. Fl. Ang. Ed.* vol. ii. p. 568. (ed. vol. i. p. 476.), *Lightf. Fl. Scot.* p. 975. t. 34. *With.* vol. iv. p. 124. *Eng. Bot.* t. 774. *Lyngb. Hyd. Dan.* p. 31. t. 6. *C.*

Var. β. *intricata*; frond very narrow, much branched, twisted and entangled, *Grev.*

DICTYOTA *dichotoma*, β. intricata, *Grev. Alg. Brit.* p. 58. *Menegh. Alg. Ital. and Dalm.* p. 227.

DICTYOTA implexa, *Lamx. l. c. J. Ag. Alg. Medit.* p. 37. *Mont. Fl. Alg.* p. 30.

DICHOPHYLLIUM implexum, *Kütz. Phyc. Gen.* p. 338.

HAB. Parasitical on various Algæ; also growing on rocks and stones in tide-pools near low-water mark, and at a greater depth. Annual. Summer. Both varieties common on the British Coasts.

GEOGR. DISTR. Abundant throughout the Atlantic Ocean, extending from the shores of Norway to the tropic. Southern Ocean, Western Shores of South America; Cape of good Hope; New Zealand.

DESCR. *Root* small, coated with fibres. *Fronds* several from the same base, from three to twelve inches in length, from $\frac{1}{8}$ to $\frac{1}{2}$ an inch in breadth, cuneate at base, afterwards nearly linear, very many times divided in a regularly dichotomous manner; segments generally very erect, with narrow interstices, occasionally more or less spreading. *Substance* delicately membranaceous, *Colour* olivaceous towards the tips. *Fructification*; oval clusters of spores, covered at an early age with a vesicular membrane formed by a blistering of the cuticle, fixed by their bases, obovate, with a wide limbus, and finally parted into four sporules. 2. (on distinct plants) solitary, roundish spores (?) scattered among the cells of the surface.—Var. β. is very much narrower, about a line in diameter at the base, and not a fourth of a line above, dark brown, coarser in substance, with more patent axils, and frequently spirally twisted.

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A very common plant, the most widely dispersed of the genus to which it belongs, being found along the shores of the greater part of the temperate ocean, and also in many intertropical localities. As might be expected, it varies considerably according to the circumstances under which it grows, though without any respect to *climate,* the most opposite varieties being frequently found on the same shore. The variations appear to result merely from the depth of water at which the plant grows, and the degree of exposure to waves and currents to which it is subjected. In rock-pools near high-water mark and to half-tide level the narrow variety, which sometimes is much narrower and greatly more intricate than our figure represents, is the commoner. Near low-water mark in rock-pools, and among the *Laminariæ* in sheltered bays, the broad variety occurs, of which the average size is represented in the figure; but some specimens in my Herbarium, gathered by Miss Hincks, at Ballycastle, on the coast of Antrim, are very much wider and proportionably less compound, and bear a considerable resemblance to the tropical *D. Schröderi.*

The narrow variety, especially when spirally twisted as it commonly is, looks very like a different species, and is regarded by several continental authors as such. But it is merely distinct in its extreme forms. Intermediate specimens connect it absolutely with the broader individuals, and differences in relative breadth are the most uncertain of all characters, especially among the leafy marine plants. The diameter of cylindrical kinds is more constant.

Fig. 1. DICTYOTA DICHOTOMA, var. *α*. 2. The same, var. β:—both *of the natural size.* 3. Portion of the frond with a vertical view of a sorus. 4. A vertical section of a sorus. 5. A spore. 6. Portion of the frond, with scattered spores:—*all magnified.*
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Pl. CIV.

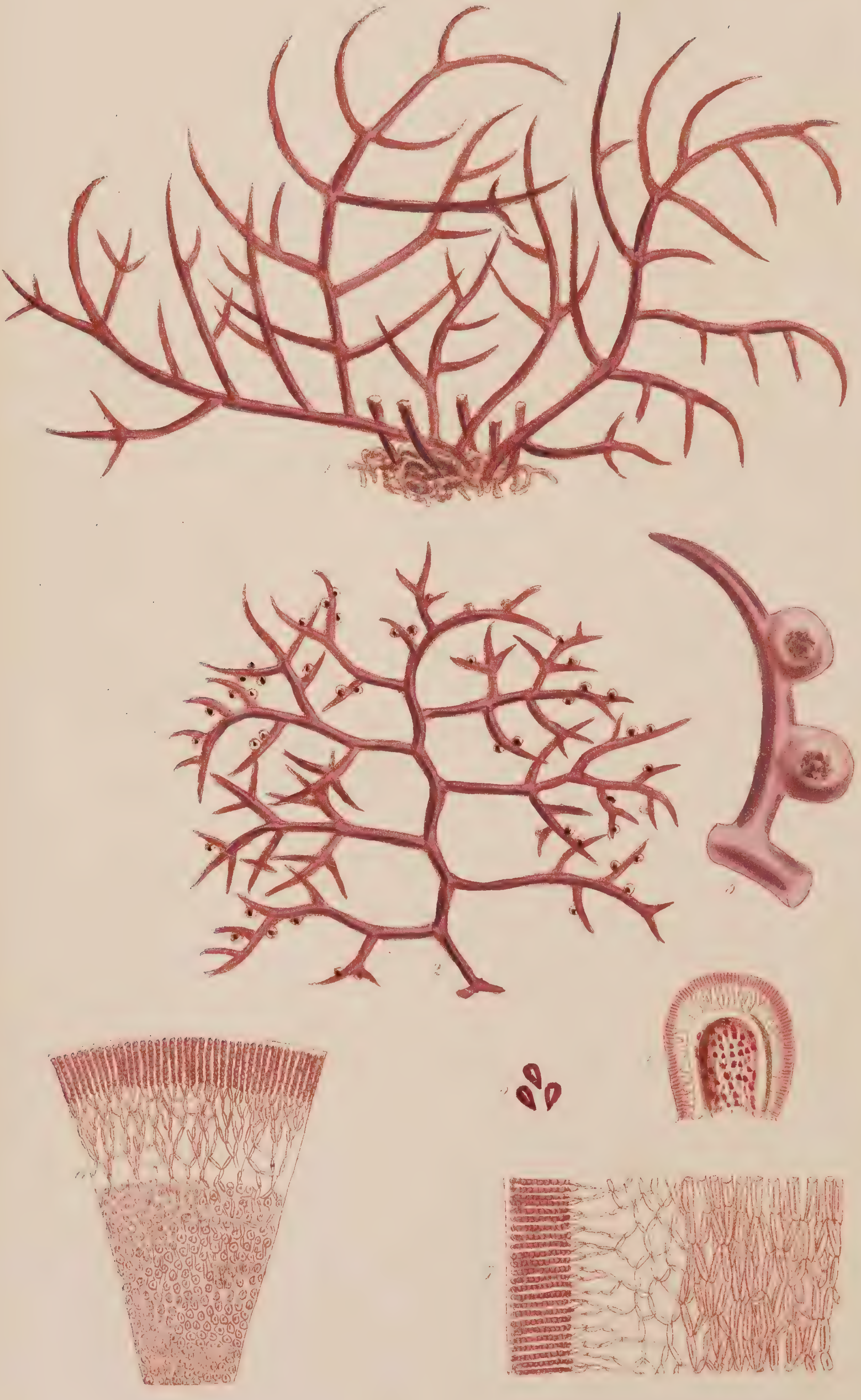


PLATE CIV.

GIGARTINA ACICULARIS, *Lamour.*

GEN. CHAR. *Frond* cartilaginous, either filiform, compressed or flat, irregularly divided; purplish-red; the *axis* or central substance composed of branching and anastomosing longitudinal filaments; the *periphery* of dichotomous filaments laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1. external *tubercles* containing, on a central placenta, dense clusters of spores *(favellidia)* held together by a net-work of fibres; 2, *tetraspores* scattered among the filaments of the periphery.—GIGARTINA (*Lamour.*), from γίγαρτον, a *grape-stone*; which the tubercles resemble.

GIGARTINA *acicularis*; frond cylindrical, filiform, irregularly branched, between pinnated and dichotomous; branches divaricating, curved; ramuli few, very patent or recurved, subulate, often secund; tubercles spherical, scattered on the branches.

GIGARTINA acicularis, *Lamx. Ess.* p. 49. *Gaill. Dict. Sc. Nat.* 53. p. 365. *Duby. Bot. Gall.* p. 953. *Grev. Alg. Brit.* p. 147. t. 16. *Hook. Br. Fl.* vol. 2. p. 300. *Wyatt, Alg. Danm.* No. 26. *Harv. Man.* p. 75. *J. Ag. Alg. Medit.* p. 105. *Mont. Fl. Alger.* p. 100. *Kütz. Phyc. Gen.* p. 403.

SPHÆROCOCCUS acicularis, *Ag. Sp. Alg.* 1. p. 322. *Ag. Syst.* p. 237.

FUCUS acicularis, *Wulf. Crypt. Aquat.* No. 50. *Turn. Hist.* t. 126. *Sm. Eng. Bot.* t. 2190.

HAB. On submarine rocks, near low-water mark. Annual. Winter. Rare. Cornwall, *Mr. W. Rashleigh.* Ilfracombe, Lupton Cove and Torquay. *Mrs. Griffiths.* Sidmouth, *Miss Cutler.* Jersey, *Miss White and Miss Turner.* Belfast Bay, *Mr. Templeton.* Valentia, abundant; Kilkee, very rare, *W. H. H.*

GEOGR. DISTR. Abundant on the shores of France and Spain. Mediterranean Sea. Indian ocean, *Wight.* Tasmania, *Dr. Hooker.*

DESCR. *Root* discoid, accompanied by decumbent, branching fibres. *Fronds* two to four inches high, as thick as small twine, densely tufted, and often matted together, very irregularly branched; sometimes the main divisions of the frond are tolerably regularly dichotomous, four or five times divided, with very patent axils, and long naked segments, forked at the tips, and bare of ramuli; sometimes and more frequently, they are more or less regularly pinnate, the main stem angularly flexuous, furnished with several, opposite or alternate, divaricating, or frequently recurved, elongated sub-simple, and nearly distichous branches, which are naked below, and more or less furnished in their upper part with very patent ramuli *Ramuli* various in length, sometimes short and spine-like, sometimes elongate and furnished with a second series, all tapering to an acute point. *Substance* firmly cartilaginous, when first gathered long resisting the action of fresh water;

but if once dried, and again moistened, it soon decomposes. *Tubercles* very rare, as large as poppy-seed, irregularly scattered over the branches and ramuli. *Tetraspores* I have not seen. *Colour* a dull purple red, becoming pink in fresh water.

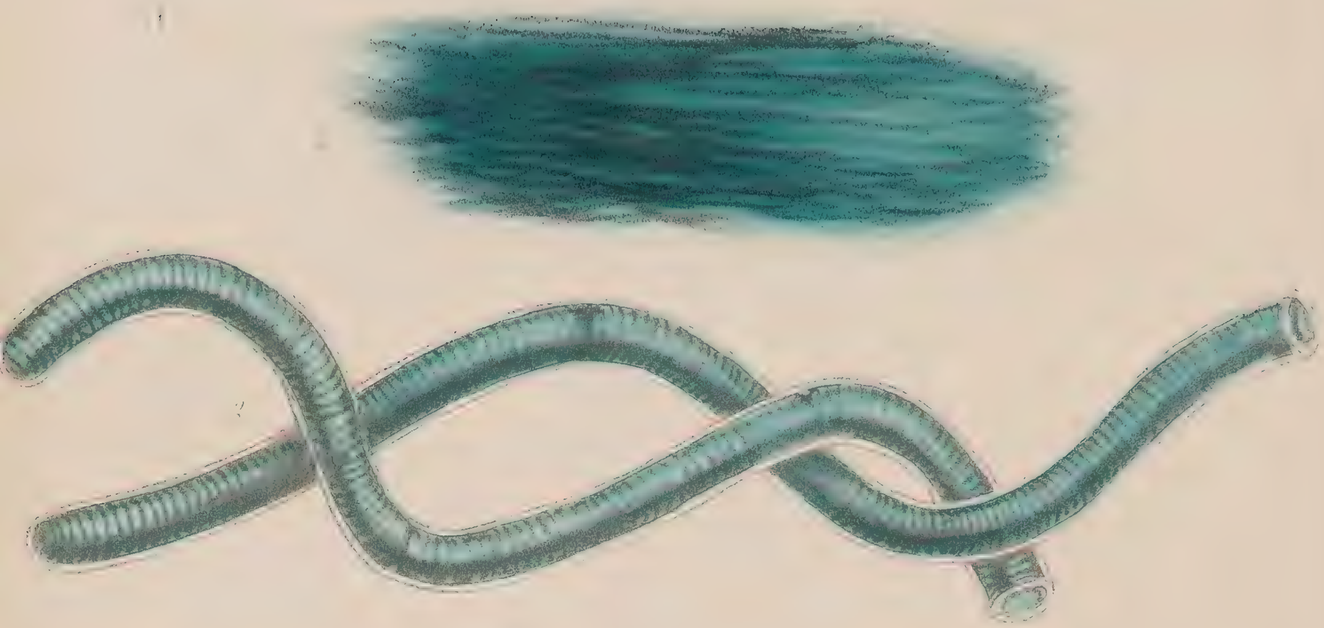
* * *

The genus *Gigartina* has been peculiarly unfortunate in the revolutions which it has undergone according to the views of different authors, or of the same authors at different times. As originally established by Lamouroux, its limits were very uncertain indeed, and it included a heterogeneous assemblage of species among which *Laurencia dasyphylla, Rhodomela subfusca, Chordaria flagelliformis,* and the *Chylocladiæ,* with several others were associated together. Lyngbye, while he weeded out several false species added to the confusion by introducing *Desmarestia viridis.* The first real reformation of the genus was that proposed by Dr. Greville in 1830, though he has admitted some species of an opposite structure to that of his type, and excluded others which coincide with it. I was myself accessory to a step being made in the wrong direction in Sir W. J. Hooker's 'British Flora', where the *Gracilariæ* are erroneously combined with the *Gigartinæ.* That the combination is unnatural will be evident by a comparison of the magnified sections of our present plate, with those given of *Gr. confervoides* at Pl. LXV.; the structures are widely different. The last revision of the genus, by Professor J. Agardh, has at length fixed structural limits, more natural than those ascertained by mere outward habit, and from this results the rather startling fact, that *Iridæa radula,* Bory, is a true species of *Gigartina.* Separated from its affinities such a connexion would hardly be supposed, but the passage through *Iridæa stiriata,* to *Gigartina livida,* and from that to the subject of our present plate is easy and natural.

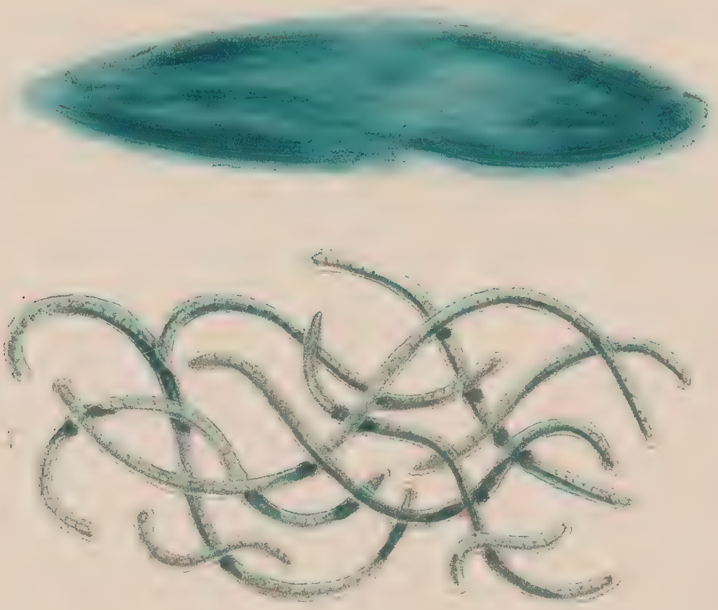
Besides *G. acicularis,* we have two other British species, *G. pistillata* and *Teedii,* both plants of extreme rarity in this country, though abundant in the South of Europe. *G. plicata* and *G. Griffithsiæ,* of 'British Flora' have been formed into a separate genus; and the remaining species restored to *Gracilaria.*

Fig. 1. GIGARTINA ACICULARIS, a barren specimen. 2. A specimen in fruit; *both of the natural size.* 3. A ramulus with tubercles. 4. A section of a tubercle. 5. Spores. 6. Part of a transverse section of the frond. 7. Part of a longitudinal section:—*all magnified, the two latter figures highly so.*

A



B



C

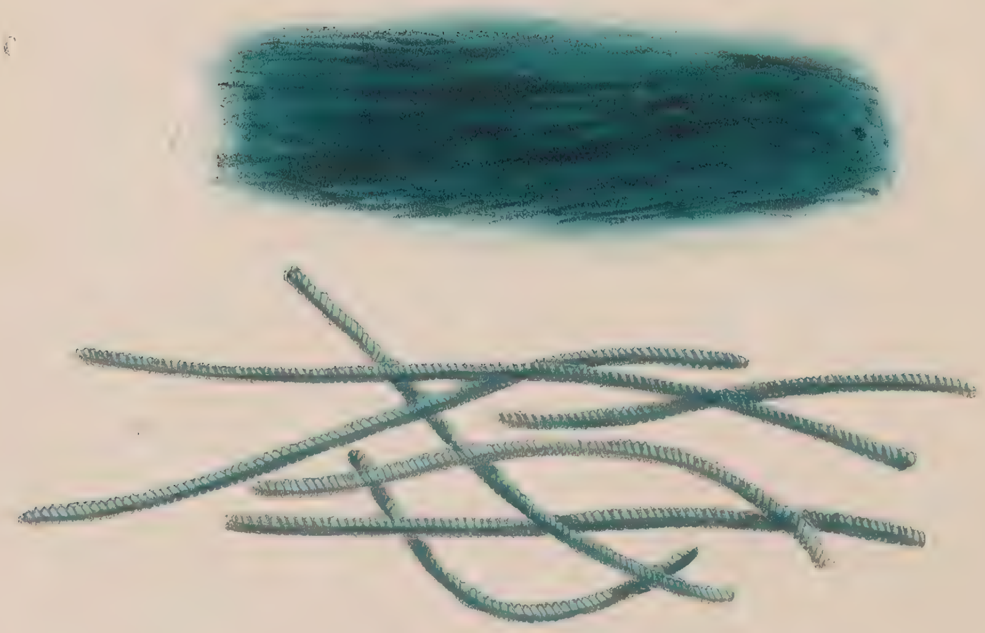


PLATE CV. *A.*

OSCILLATORIA LITTORALIS, *Carm.*

GEN. CHAR. *Filaments* lying in a mucous matrix, rigid, simple, acicular, vividly oscillating. *Tube* continuous; endocrome green, densely annulated with close, parallel, transverse striæ.—OSCILLATORIA, (*Vauch.*), from the motion observed in the filaments, which resembles the *oscillations* of a pendulum.

OSCILLATORIA *littoralis,* Carm. Stratum of a vividly æruginous green colour; filaments thick, dark green, variously curved; striæ conspicuous, close-set.

OSCILLATORIA littoralis, *Carm. Alg. Appin. ined. Harv. in Hook. Brit. Fl.* vol. ii. p. 375. *Harv. Man.* p. 165.

HAB. In pools, along the muddy sea shore, flooded by Spring tides. Appin, *Capt. Carmichael.*

DESCR. *Stratum* exceedingly thin, slimy, bullated by the extrication of air bubbles, of a dark green colour, spreading to an indefinite extent over the muddy bottom of the pool. *Filaments* 1–2 lines long, much thicker than those of *O. nigra,* straight or slightly curved, radiating very irregularly, and generally in twisted bundles. *Striæ* strongly marked, at intervals of about one third the diameter of the filament ". *Carm. l. c.*

Of this I have only seen Capt. Carmichael's specimens, from one of which the figure is taken. I find the filaments curved and twining together; the striæ very dense, and the mass of endochrome divided at uncertain intervals into portions, which probably break off eventually and become new filaments.

A. Fig. 1. OSCILLATORIA LITTORALIS, part of a stratum:—*of the natural size.*
2. Filaments:—*highly magnified.*

PLATE CV. *B.*

OSCILLATORIA SPIRALIS, *Carm.*

OSCILLATORIA *spiralis*; stratum membranaceous, or coriaceous, æruginous or blackish-green; without much lubricity; filaments slender, spirally twisted, densely interwoven, radiating in all directions.

OSCILLATORIA spiralis, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. 2. p. 377. *Harv. Man.* p. 167.

OSCILLATORIA subsalsa, *Harv. l. c.* p. 376. *Harv. Man.* p. 165.

SPIRILLUM rupestre, *Hass. Freshw. Alg.* p. 277. t. 75. f. 6.

HAB. On rocks by the sea-side, above and between tide marks. At Appin by rocks where birds are in the habit of resting, *Capt. Carmichael.*

Brighton, on a plank between high and low water mark, *Mr. Borrer;* Rocks by the Sea, Penzance, *Mr. Ralfs.*

GEORG. DISTR. Coast of France.

DESCR. *Stratum* of indefinite extent, firm, membranaceous or coriaceous, peeling off in large flakes, without much lubricity, and without gloss when dry, of a dark green when growing above high-water mark, and a blueish green when submerged. *Filaments* slender, densely interwoven together, twisted like the letter *S*, or like a corkscrew, radiating in all directions.

The specimens from the South of England are of a much brighter colour, and the stratum thinner than in the original Scotch specimens, but the microscopic character is very similar. Whether the *O. subsalsa* of Agardh be different, I am unable to say.

B. Fig. 1. OSCILLATORIA SPIRALIS; part of a stratum:—*of the natural size.*
2. Filaments:—*highly magnified.*

PLATE CV. *C.*

SPIRULINA TENUISSIMA, *Kütz.*

GEN. CHAR. *Filaments* lying in a mucous layer, rigid, simple, spirally twisted, vividly oscillating. *Tube* continuous; endochrome green, more or less distinctly annulated.—SPIRULINA (*Turp.*). a diminutive of *spira,* a twist or curl.

SPIRULINA *tenuissima;* "stratum very lubricous, æruginous, subradiant; filaments densely spiral, very slender, parallel, flexuous".

SPIRULINA tenuissima, *Kütz. Phyc. Gen.* p. 183. *Ralfs,* in *Ann. Nat. Hist.* vol. xvi. p. 309. Pl. 10.

HAB. On decaying *Algæ* in a brackish pool near the Menai Bridge, and on sticks in brackish pools at Penman Pool near Dolgelly, *Mr. Ralfs.* Aberdeen, *Dr. Dickie.*

GEOGR. DISTR. Europe.

DESCR. "It forms at first a thin pellicle of a rich green colour, but in an advanced state becomes somewhat skin-like and tinged with brown; the filaments are extremely slender, of a pale blueish green colour, elongated, straight when free, equal, not attenuated at the extremities, vividly oscillating. *Spires* very close, like the volutions of some shells, broader than long. There is no appearance of granular matter, and the filaments are so fine that I cannot ascertain whether they are jointed". *Ralfs. l. c.*

Having never seen this plant in a living state, I prefer giving Mr. Ralfs' excellent description in his own words. I am indebted to Dr. Dickie for beautiful dried specimens, from one of which my figure has been taken.

C. Fig. 1. SPIRULINA TENUISSIMA, part of the stratum:—*of the natural size.*
2. Filaments,:—*highly magnified.*

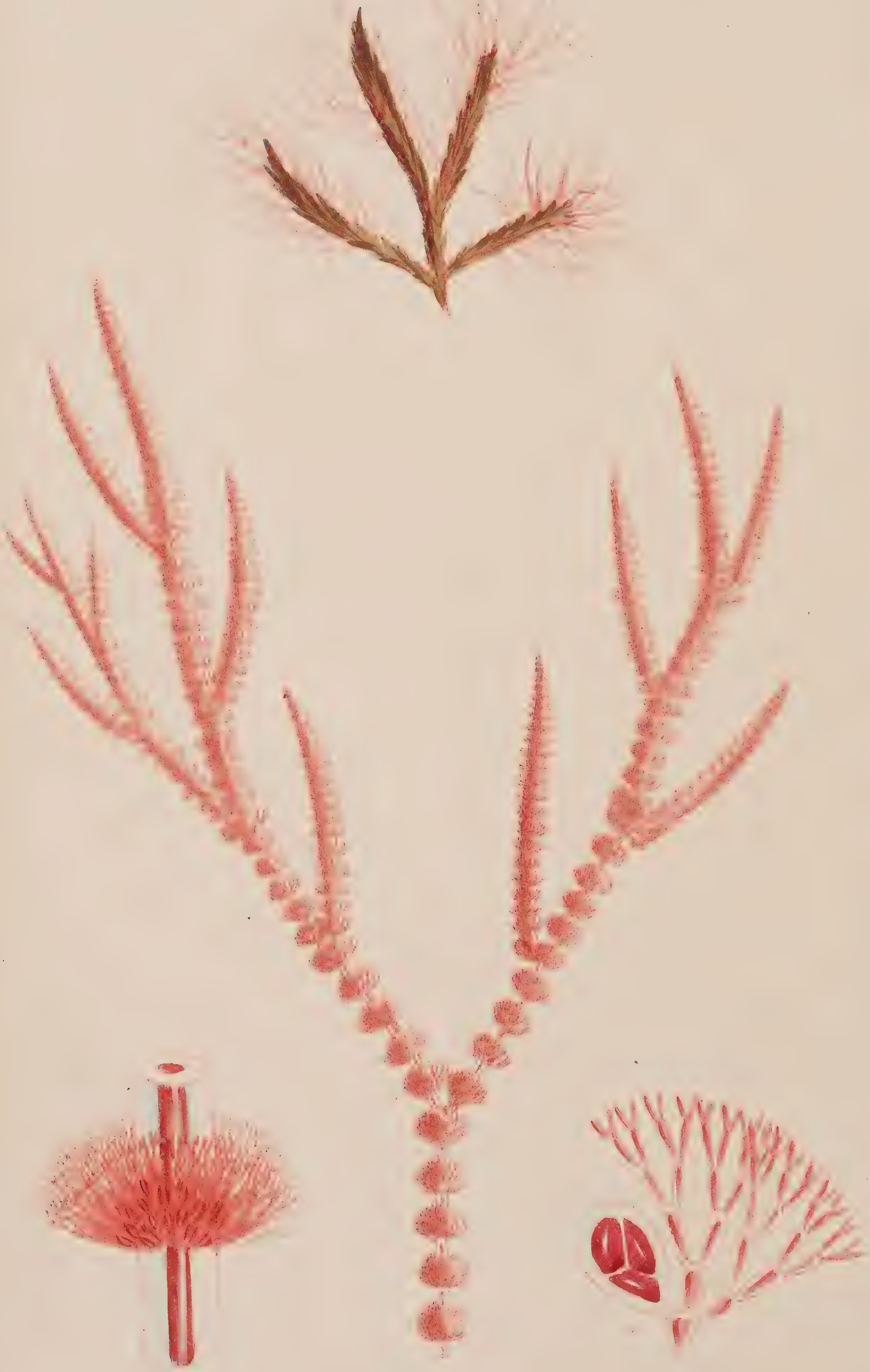


PLATE CVI.

CROUANIA ATTENUATA, *J. Ag.*

GEN. CHAR. *Frond* gelatinous, filiform, consisting of a jointed, single-tubed filament, whose joints are clothed with dense whorls of minute, multifid ramelli. *Fructification,* of two kinds on distinct individuals; 1. " *Favellidia* subsolitary near the apex of the ramuli, affixed to the base of the whorled ramelli and covered by them, containing, within a hyaline membranaceous perispore a subglobose mass of minute spores". 2. Obovate *tetraspores* of large size, affixed to the bases of the ramelli.—CROUANIA, (*J. Ag.*), in honour of the Brothers Crouan, of Brest, celebrated among French Algologists.

CROUANIA *attenuata.*

CROUANIA attenuata, *J. Ag. Alg. Medit.* p. 83. *Endl. 3d. Suppl.* p. 36.

MESOGLOIA attenuata, *Ag. Syst.* p. 51.

MESOGLOIA moniliformis, *Griff. in Wyatt, Alg. Danm.* No. 197. *Harv. Man* p. 49.

GRIFFITHSIA nodulosa, *Ag. Sp. Alg.* vol. ii. p. 136.

CALLITHAMNION nodulosum, *Kütz. Phyc. Gen.* p. 373.

BATRACHOSPERMUM attenuatum, *Bonnem.*

HAB. Parasitical on the smaller *Algæ.* Annual. Summer. Very rare. On *Cladostephus spongiosus* at Salcombe Bay, *Mrs. Wyatt.* Mousehole near Penzance, *Mr. Ralfs.*

GEOGR. DISTR. Mediterranean and Adriatic Seas. Atlantic Coast of France, very rare. South Coast of England.

DESCR. *Fronds* densely tufted, one to two inches high, very tender and gelatinous, capillary, excessively branched, and bushy; the divisions alternate, many times divided, patent, moniliform, attenuated at the extremity. The branches consist of a jointed filament, with a very narrow endochrome, and wide limbus, from the nodes of which issue very dense, globular whorls of dichotomous, multifid ramelli. The lowermost joints of the main filament or axis are several times longer than broad; the upper ones becoming gradually shorter, and the ultimate are scarcely longer than their diameter. As each dissepiment produces its whorls, it thus happens that the lowest whorls are far asunder, the upper gradually closer together, and the ultimate ones imbricating each other. The ramelli of which the whorls consist are regularly dichotomous and fastigiate. *Tetraspores* of very large size, obovate, tripartite, borne on one of the basal joints of the ramelli, sessile. *Favellæ* I have not seen. *Colour* a brownish or purplish red.

* * *

This beautiful little plant was first noticed by Bonnemaison, on the northern shores of France, where it appears to be of as rare occurrence as it is in England. Subsequently, Agardh detected it in both the Adriatic and Mediterranean Seas, from various localities of whose shores I have received specimens, rather more luxuriant than our British plants, but not affording any essential distinctions. Mrs. Wyatt was the fortunate discoverer in England, in the year 1838, and it was first made known to British botanists in her excellent 'Algæ Danmoniensis' under the expressive name *Mesogloia moniliformis,* which we regret cannot be preserved, owing to the prior claim of the comparatively unmeaning epithet bestowed by the first discoverer.

By Bonnemaison it was referred to *Batrachospermum,* with which genus it perfectly agrees in habit, and has many points of direct affinity, but its structure, though similar in many respects, is not identical. Agardh originally placed it in *Mesogloia,* afterwards, less happily, in *Griffithsia.* Mrs. Griffiths was the first to suggest it might prove the type of a new genus, allied on the one hand to *Dudresnaia,* on the other to *Batrachospermum,* and the younger Agardh has accordingly assigned to it the name it here bears. It must be confessed, however, that, except for the very decided gelatine, and some difference in the conceptacular fruit (as described by J. Agardh), there is little to separate it from *Callithamnion,* to which genus it is united by Kützing. Were the ramelli opposite instead of whorled, the habit would be very similar to that of *Cal. floccosum,* and others of the same section.

Professor J. Agardh describes the '*Favellidia*' as the only fruit with which he was aquainted, but I have never found them on British specimens, on which, on the contrary, *tetraspores* are commonly formed. These last are of very large size in proportion to the size of the plant, and have a structure exactly similar to that of the tetraspores of *Callithamnion.*

C. attenuata is of extreme rarity on our coasts, having hitherto, as far as I am aware, been only found in the two stations given above.

Fig. 1. CROUANIA ATTENUATA, growing on *Cladostephus spongiosus*:—*of the natural size.* 2. A branch. 3. Portion of the stem, with a whorl. 4. A filament from the whorl, bearing a tetraspore:—*all variously magnified.*

Pl. CVII.

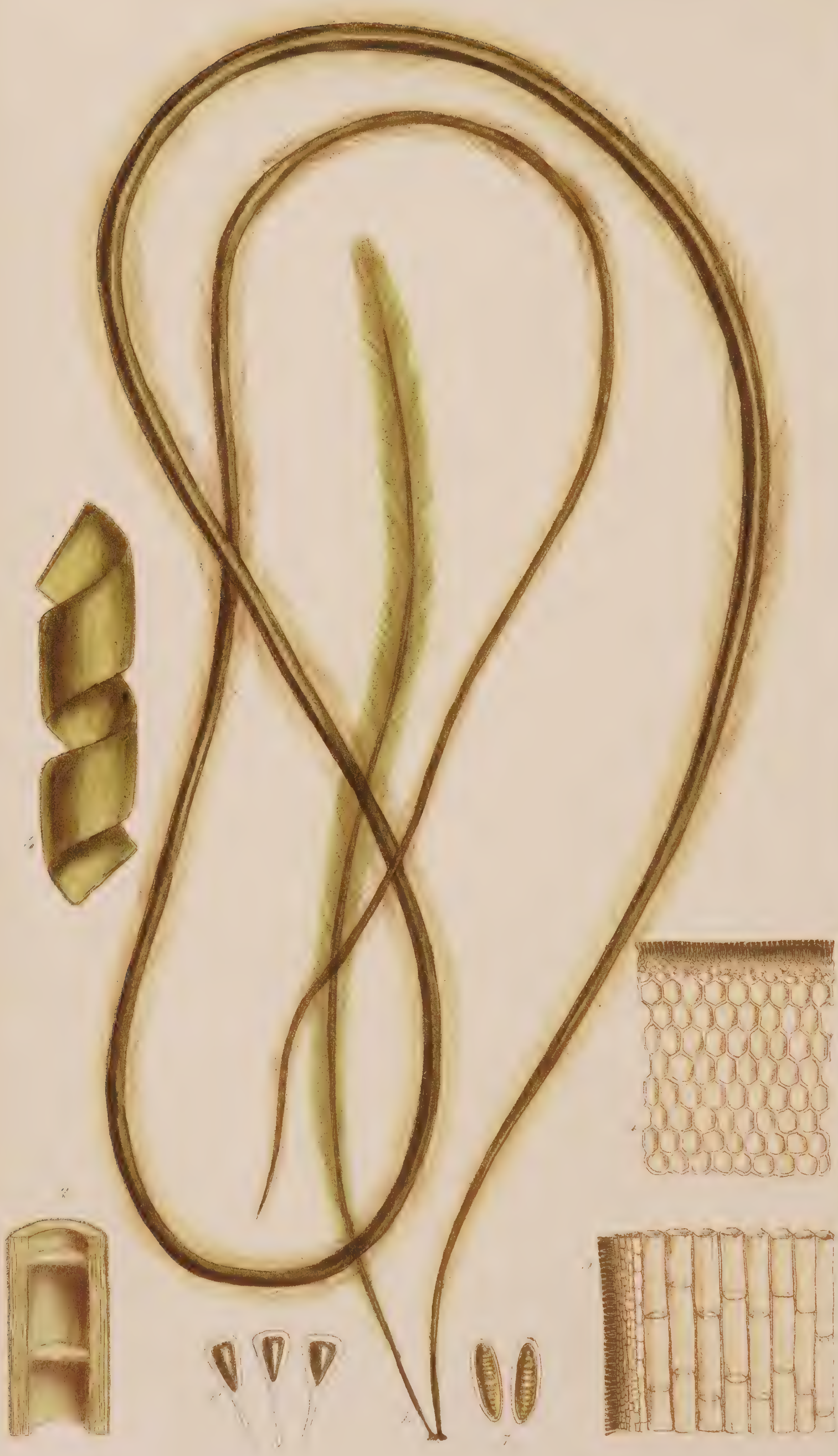


PLATE CVII.

CHORDA FILUM, *Lamour.*

GEN. CHAR. *Root* scutate. *Frond* simple, cylindrical, tubular; its cavity divided by transverse, membranous septa, into separate chambers. *Fructification*; a stratum of obconical spores, much attenuated at the base, covering the whole external surface of the frond. Among these are found elliptical *antheridia* (?). CHORDA (*Stack.*)—a *cord*.

CHORDA *filum*; frond cartilaginous, lubricous, clothed with pellucid hairs, filiform, very long, tapering to each extremity, not constricted at the dissepiments.

CHORDA filum, *Lamour. Ess.* p. 26. *Lyngb. Hyd. Dan.* p. 72. t. 18. *Hook. in Fl. Lond. N.S.* t. 204. *Grev. Alg. Brit.* p. 47. t. 7. *Hook. Br. Fl.* vol. ii. p. 276. *Harv. in Mack. Fl. Hib.* part 3. p. 174. *Harv. Man.* p. 36. *Wyatt, Alg. Danm.* no. 159. *Kütz. Phyc. Gen.* p. 334. t. 29.

CHORDARIA filum, *Ag. Syn.* p. 13. *Hook. Fl. Scot.* part 2. p. 98.

SCYTOSIPHON filum, *Ag. Sp. Alg.* vol. i. p. 161. *Ag. Syst.* p. 257. *Grev. Fl. Edin.* p. 288. *Spreng. Syst. Veg.* vol. iv. p. 328. *Endl. 3rd Suppl.* p. 25.

FUCUS filum, *Linn. Sp. Pl.* p. 1631. *Stack. Ner. Brit.* t. 10. *Turn. Hist.* t. 86. *Eng. Bot.* t. 2487.

FUCUS tendo, *Esper, Ic.* t. 22.

CERAMIUM filum, *Roth, Cat. Bot.* vol. i. p. 147.

Var. β. *tomentosa*; of small size, more densely clothed with coloured, olive or green hairs.

CHORDA tomentosa, *Lyngb. Hyd. Dan.* p. 74. t. 19.

HAB. On rocks and stones in the sea, commencing within tide marks, and extending in still water to the depth of ten or fifteen fathoms. Annual. Summer and Autumn. Very abundant on the shores of the British Islands.

GEOGR. DISTR. Abundant throughout the North Atlantic, on the shores of Europe and America. Coast of Brazil. Also in the North Pacific, at Sitka, Unalaschka and Kamtschatka.

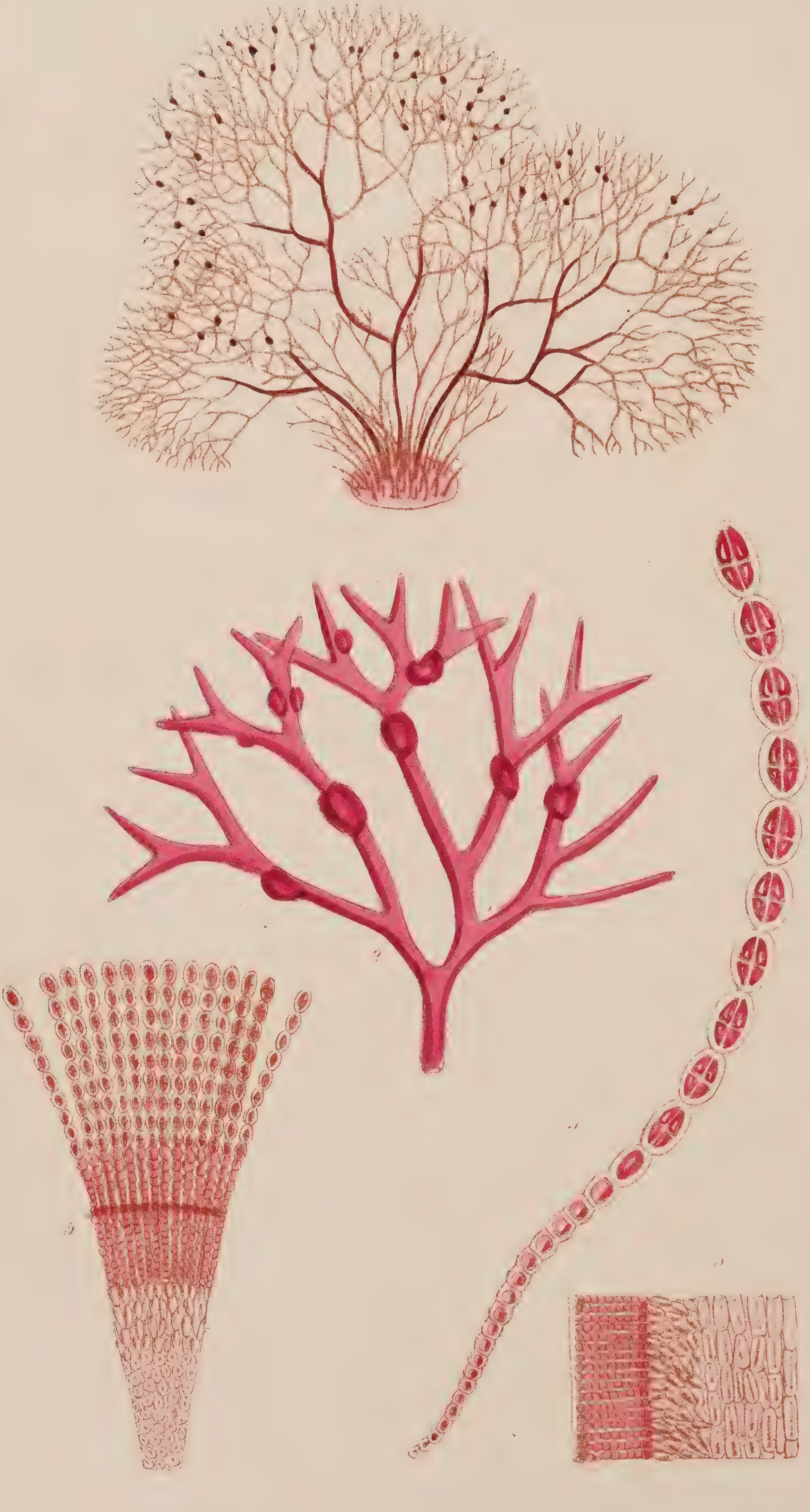
DESCR. *Root*, a minute disc. *Fronds* tufted, one to twenty, or in still water even forty feet in length, scarcely twice as thick as a bristle at the base, gradually increasing in thickness to the middle, and there from a quarter to half an inch in diameter, and again gradually diminishing toward the apex, which is of equal tenuity with the base, cylindrical, hollow, divided at short intervals, by very thin membranes, into chambers or joints, which are not visible externally, very lubricous or slimy, clothed at an early stage with very dense, slender, gelatinous filaments, which generally disappear as the plant advances to maturity, but may sometimes be found on old plants. *Substance* cartilaginous and firm, very tough when recent. *Fructification* covering the whole surface of old plants, consisting of obconical, vertical spores, supported on long pedicels, by which they are fixed to the outer stratum of cellular tissue. Mixed with these are found numerous narrow, elliptical, transversely striate bodies, which may be antheridia. The walls of the frond are formed of several rows of hexagonal jointed longitudinal filaments, combined together: the inner of which are of large size, with long joints, the outer very minute and densely packed together.

* * *

Few persons can visit the coast without becoming familiar with this common plant, which is to be found in greater or less perfection on all our shores. But it is in quiet land-locked bays, with a sandy or somewhat muddy bottom, and in from three to six fathoms water that it reaches its greatest size. In such places it frequently forms extensive submarine meadows, so dense as seriously to affect the passage of boats, and to endanger the life of the unfortunate swimmer who may chance to become entangled in its slimy cords, which when growing have considerable tenacity. The smaller variety, which is by some authors considered a distinct species, occurs between tide marks. Were it of uniform size, and always distinguished by a denser and brighter coloured covering of filaments, its rank might, perhaps, be acknowledged; but I have found it impossible to fix its limit in either character. It is connected by insensible gradations with the common form. Some of the most distinct looking individuals of this variety which I have seen, I owe to the kindness of Mr. Ralfs, who procured them at Penzance.

The fructification of this plant is more like that of the *Laminarieæ* than of any *Dictyoteæ*, with the exception of the Antarctic genus *Adenocystis*, which differs from *Chorda* more by habit than any carpic character. Through *C. Lomentaria*, if that plant really be a congener, there is a connection with *Asperococcus*, and so with the other *Dictyoteæ*. Still I am inclined to think, notwithstanding the different habit, that the present plant is properly a member of the *Laminaria* group, in affinity as well as in habitat. What I have called *antheridia*, which I find abundantly mixed with the true spores, are perhaps what were first observed by the late Capt. Carmichael, and are figured from his sketch in the 'Flora Londinensis.'

Fig. 1. CHORDA FILUM, both varieties, young plants:—*of the natural size.* 2. A longitudinal semi-section of the frond. 3. The frond unrolled. 4. Transverse section of the wall of the frond. 5. Longitudinal section of the same. 6. Spores. 7. Antheridia (?):—*all more or less magnified.*



W. H. H. del. et lith.

Reeve imp.

PLATE CVIII.

GYMNOGONGRUS GRIFFITHSIÆ, *Mart.*

GEN. CHAR. *Frond* cylindrical, filiform, horny, much branched; its substance composed of densely packed filaments, of which the innermost are longitudinal, the middle curving outwards, and the external stratum (or periphery) horizontal and moniliform. *Fructification*; naked warts entirely composed of strings of cruciate tetraspores. GYMNOGONGRUS (*Mart.*)—from *γυμνος, naked,* and *γογγρος,* a word applied by Theophrastus to a disease resembling a swelling, to which trees are subject; the allusion is to the appearance of the fruit in these Algæ.

GYMNOGONGRUS *Griffithsiæ*; frond filiform, flexuous, cartilaginous, stipitate, many times dichotomous, the apices fastigiate, forked; warts of fructification oblong, at length surrounding the stem.

GYMNOGONGRUS Griffithsiæ, *Mart. Fl. Braz.* vol. i. p. 27. *Mont. Fl. Algier.* p. 119.

TYLOCARPUS Griffithsiæ, *Kütz. Phyc. Gen.* p. 411.

TYLOCARPUS tentaculatus (?) *Kütz. l. c.* t. 70. f. 2.

CHONDRUS Griffithsiæ, *J. Ag. Alg. Medit.* p. 95. *Endl. 3rd Suppl.* p. 39.

GIGARTINA Griffithsiæ. *Lamour. Ess.* p. 49. *Lynbg. Hyd. Dan.* p. 43. t. 11. *Grev. Alg. Brit.* p. 149. *Hook. Br. Fl.* vol. ii. p. 301. *Harv. in Mack. Fl. Hib.* part 3. p. 201. *Harv. Man.* p. 76. *Wyatt, Alg. Danm.* no. 28. *Mont. Fl. Canar.* p. 160.

POLYIDES Griffithsiæ, *Gaill. Dict. Sc. Nat.* vol. 53. p. 365.

SPHÆROCOCCUS Griffithsiæ, *Ag. Sp. Alg.* vol. i. p. 316. *Ag. Syst.* p. 235. *Spreng. Syst. Veg.* vol. iv. p. 339.

FUCUS Griffithsiæ, *Turn. Hist.* t. 37. *E. Bot.* t. 1926.

HAB. On submarine rocks, near low-water mark. Perennial. Autumn and Winter. Sidmouth and Torquay, *Mrs. Griffiths.* Exmouth, *Miss Filmore.* Bantry Bay, *Miss Hutchins.* Balbriggan, *Dr. Scott.* Mounts Bay, *Mr. Ralfs.* Odin's Bay, Stronsa, *Lieut. F. W. L. Thomas, and Dr. Mc'Bain.* Malahide, *Mr. Mc'Calla.*

GEOGR. DISTR. Coasts of Europe, from Norway to Spain, Mediterranean Sea. Canary Islands. Boston, North America, *Mr. Emerson.*

DESCR. *Root* a disc-like expansion, spreading on the surface of the rock. *Fronds* densely tufted, one to three inches high, rather thicker than hog's bristle, simple at base, for a short distance, then forked and afterwards closely and repeatedly dichotomous, or trichotomous, with more or less regularity. Sometimes the upper branches which have received an injury, produce dense bunches of branchlets without order, but these in their divisions soon assume the forked character of the species. *Branches* flexuous, erecto-patent, with rounded axils, and more or less strictly fastigiate apices; every part cylindrical, except the apices, which are sometimes more or less compressed. Warts of fructification formed in various parts of the stem and branches, without order, at first appearing at one side of the branch, but soon extending round it, wholly formed of radiating moniliform filaments, whose upper joints are gradually transformed into elliptical, cruciate tetraspores. *Substance* cartilaginous, or somewhat horny. *Colour* varying from a brown-red to a blackish-purple.

Though hitherto placed, in British works, in the genus *Gigartina*, the structure of this plant is much more similar to that of *Chondrus*, in which genus it is placed by Professor J. Agardh. The structure, however, though, similar, is not identical; and as the tetrasporic fructification, which alone is known to us, offers some peculiarities, I adopt the name invented by Von Martius for this and the nearly allied *G. plicata*. The fructification is a most beautiful microscopic object, to which our figure does scanty justice. The exquisite symmetry of the strings of tetraspores, each marked with a white cross, and each inclosed in its glossy pellicle and brilliant as a ruby, can be but imperfectly shown on paper.

Gymnogongrus Griffithsiæ, was first correctly distinguished by Mrs. Griffiths, whose name it worthily bears. It may at once be known from *G. plicatus* by the different habit, the more regular dichotomous branching, the fastigiate apices, and the substance, which is far less tough and horny. Agardh at one time confounded it with *Gigartina acicularis*, a plant of widely different structure. Its geographical range is extensive, though not quite so great as that of *G. plicatus*. It is dispersed on most of the Atlantic shores, from a high northern latitude to the tropics, but has not yet been found in the Southern Ocean, where *G. plicatus* occurs. It generally occurs within tide marks.

Fig. GYMNOGONGRUS GRIFFITHSIÆ:—*of the natural size.* 2. Apex of a branch. 3. Transverse section of the frond, cutting through a wart. 4. One of the strings of tetraspores. 5. Longitudinal section of the frond:—*all more or less magnified.*

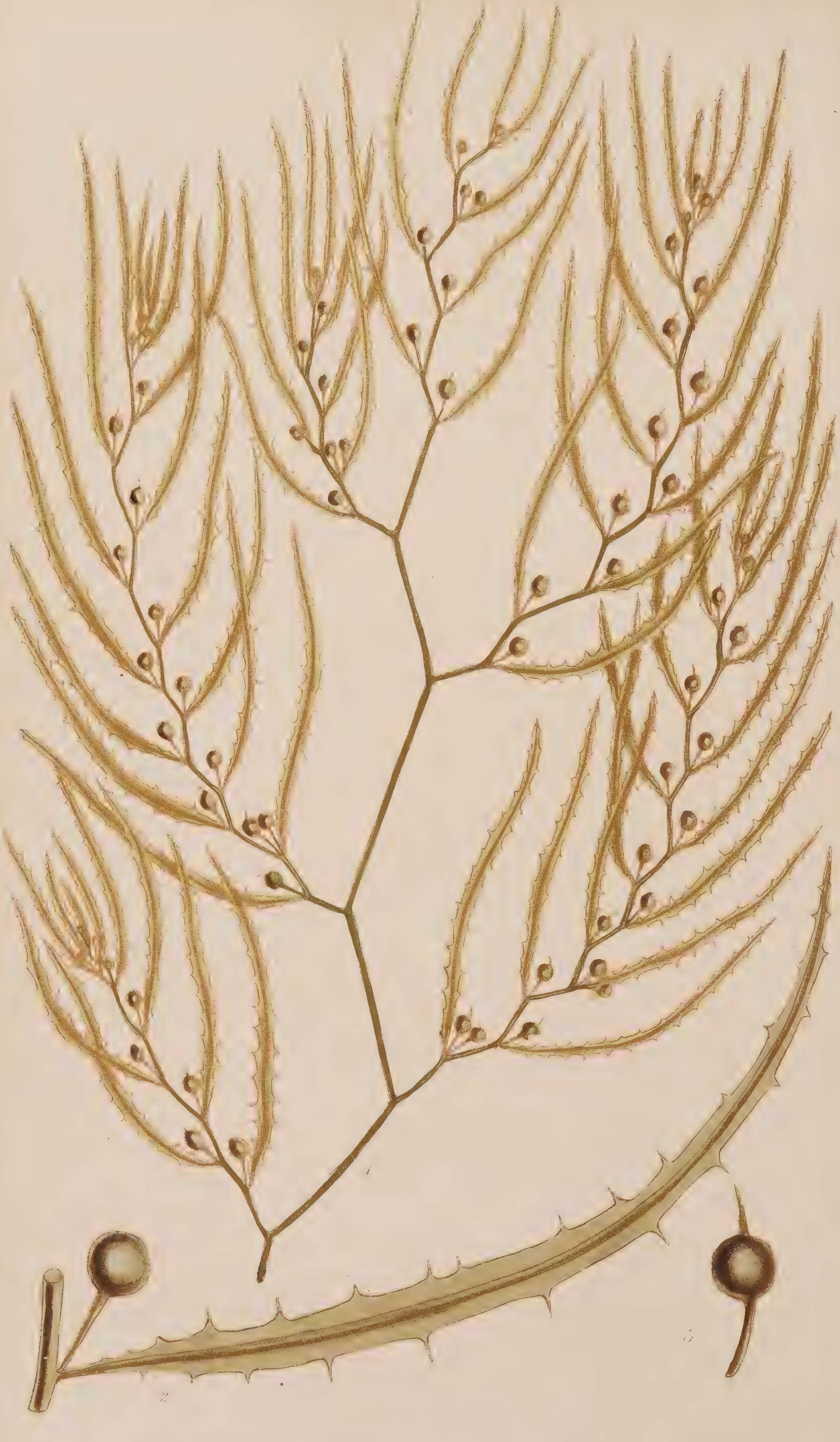


PLATE CIX.

SARGASSUM BACCIFERUM, *Ag.*

GEN. CHAR. *Frond* furnished with distinct, stalked, nerved *leaves,* and simple, axillary, stalked *air-vessels.* *Receptacles* small, linear, tuberculated, mostly in axillary clusters, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles* containing parietal *spores* and tufted *antheridia.* SARGASSUM (*Rumph.*)—a word formed from the Spanish *sargazo,* the name applied to the floating sea-weed observed by navigators.

SARGASSUM *bacciferum;* stem cylindrical, slender, much branched, flexuous; leaves linear, serrated, mostly without muciferous pores; air-vessels abundant, spherical, on cylindrical stalks, commonly mucronate.

SARGASSUM bacciferum, *Ag. Sp. Alg.* vol. i. p. 6. *Ag. Syst.* p. 294. *Spreng. Syst. Veg.* vol. iv. p. 320. *Grev. Alg. Brit.* p. 3. *Hook. Br. Fl.* vol. ii. p. 264. *Harv. Man.* p. 17.

FUCUS bacciferum, *Turn. Hist.* t. 47. *Sm. E. Bot.* t. 1967.

FUCUS natans, *Esper, Ic.* vol. i. p. 49. t. 23.

FUCUS sargasso, *Gmel. Hist. Fuc.* p. 92.

HAB. Occasionally cast on the British coasts, but not a native of our waters. Orkney Islands, *Dr. P. Neill.* Shore of Castle Eden Dean, Durham, *Mr. W. Backhouse.*

GEOGR. DISTR. Tropical and sub-tropical ocean, throughout both hemispheres, always found floating on the surface of the sea.

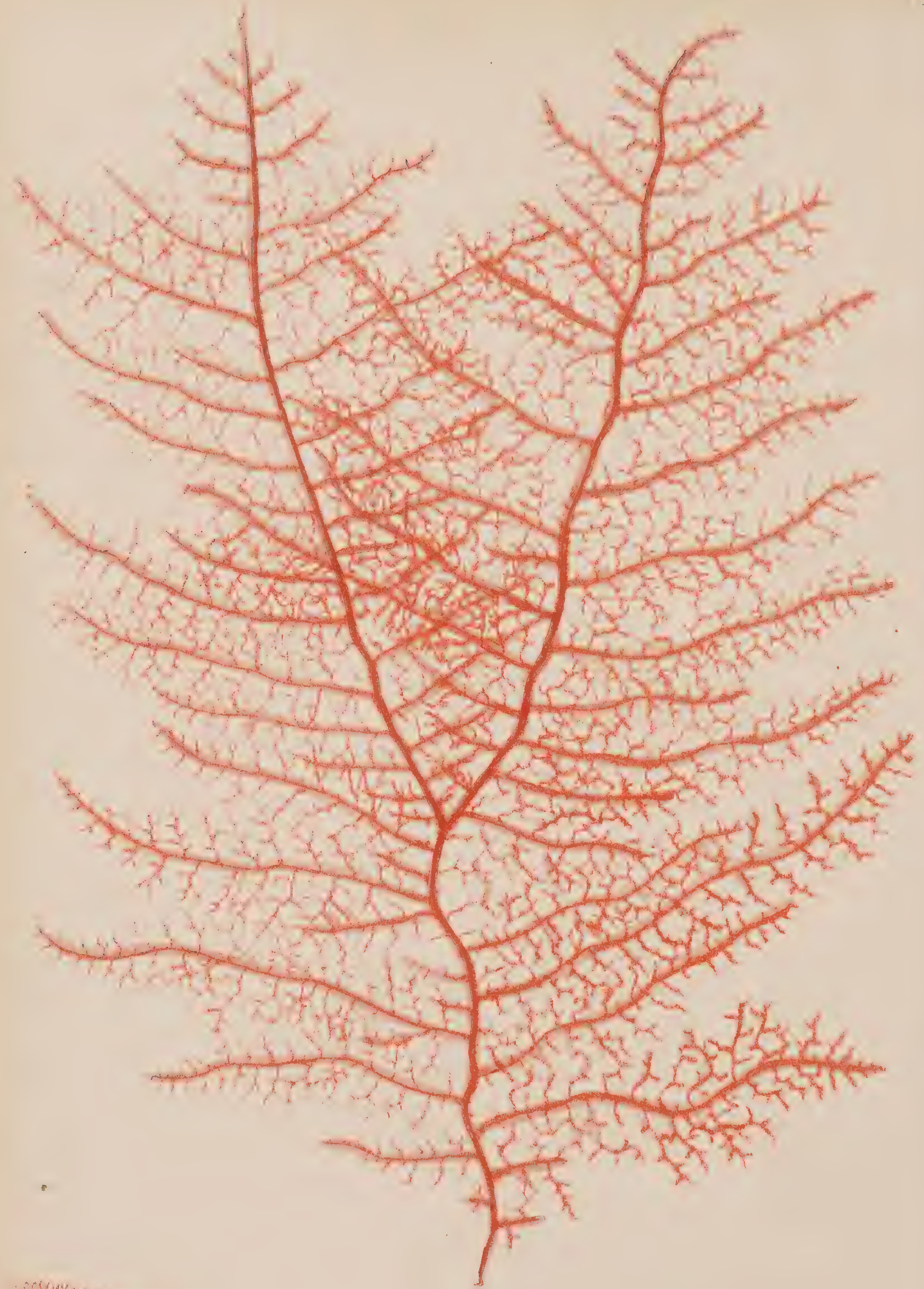
DESCR. *Fronds* a foot or more in length. *Stems* growing in all directions from a central point, forming globular, floating tufts, cylindrical, filiform, slender, flexuous or angularly bent, twice or thrice divided; *branches* long, simple, alternate, flexuous, pinnated with alternate leaves. *Leaves* two to three inches long, one to two lines wide, linear-lanceolate, tapering to either extremity, destitute of muciferous pores, serrato-dentate, with irregularly distant divaricating sharp teeth, furnished with a strong, percurrent midrib. *Vesicles* spherical, with or without a mucro, borne on short, cylindrical stalks in the axils of the leaves, one or more in each axil. *Fructification* unknown. *Colour,* when growing, a pale transparent greenish olive; when dry, dark brown or black. *Substance* between cartilaginous and coriaceous, brittle when recent.

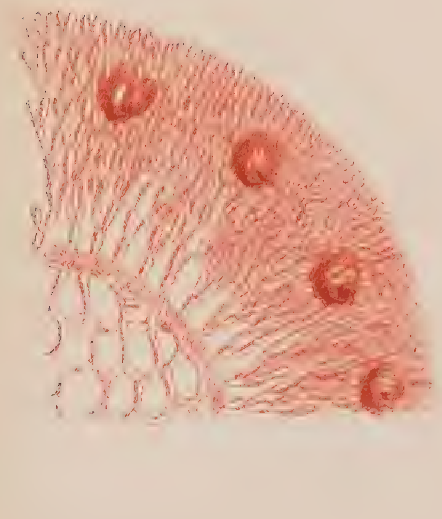
This plant, the well-known *Sargasso* or gulf-weed, has clearly no claims to be admitted to the British Flora, but having already been introduced into other works, I figure it, though obliged to make my drawing, from a foreign specimen.

The branch shown in the figure is part of a specimen picked up at sea, in the great floating bank of gulf-weed which extends at the westward of the Azores from the twentieth to thirty-sixth degree of north latitude. Another similar, but smaller bank, occurs, according to Humboldt, a short way west of the Bahamas, and between the twenty-second and twenty-sixth degrees of latitude. From the first of these, probably, the specimens which occasionally reach the British coasts, are detatched and carried northward by the great current that sweeps along the eastern shores of the American continent, and crossing the Atlantic in a high latitude, at length dissipates itself on the northern coasts of Europe. The *Sargasso* is not the only vegetable production which it brings to Shetland and Orkney. Tropical woods, and seeds are still more frequently brought, and occur all along the west of Ireland, where yet I have never known an instance of *Sargassum* having been found.

Sargassum bacciferum has been observed in the most distant parts of the Atlantic and Pacific Oceans, throughout the tropics and within a moderate distance of them, and always floating; it is therefore unfortunate that the ancient name *natans*, has not been preserved to this species, to which it is most applicable. In the great Atlantic bank it is found in ridges from ten to twenty yards wide, and of indefinite length, stretching across the sea. In this situation it continues to grow luxuriantly, and appears to multiply itself by off-sets, at first accidentally broken off, and immediately establishing themselves as independant plants. A great variety of marine animals from *Crustacea*, downwards, inhabit its branches, but I observed no parasitical Algæ on any of the specimens picked up. The list of animal species would afford subject for a small volume, but very few of them are of a strictly parasitical nature.

Fig. 1. SARGASSUM BACCIFERUM; a branch:—*of the natural size.* 2. A leaf and muticous vesicle. 3. A mucronate vesicle:—*slightly magnified.*





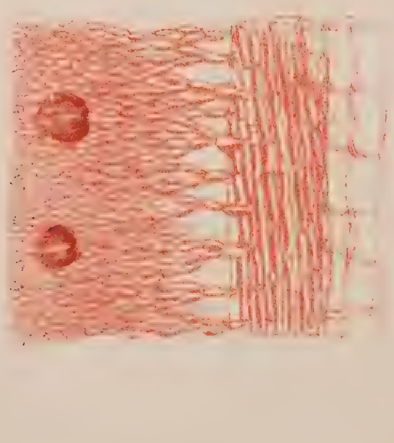


PLATE CX.

DUDRESNAIA DIVARICATA, *J. Ag.*

GEN. CHAR. *Frond* cylindrical, gelatinous, elastic; *axis* composed of a lax net-work of anastomosing filaments, coated with a stratum of closely combined, longitudinal fibres; the *periphery* of horizontal, dichotomous, moniliform filaments. *Fructification,* of two kinds on different individuals; 1, globular masses of *spores (favellidia)* attached to the filaments of the periphery. 2, external *tetraspores,* borne on the filaments of the periphery, generally terminating a ramulus. DUDRESNAIA (*Bonnem*)—in honour of *M. Dudresnay.*

DUDRESNAIA *divaricata;* frond filiform, pale red, very much branched; branches opposite or alternate, horizontal, once or twice pinnated; ramuli numerous, divaricate, irregular, obtuse.

DUDRESNAIA divaricata, *J. Ag. Alg. Medit.* p. 85. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA divaricata, *Ag. Syst. Alg.* p. 51. *Kütz. Phyc. Gen.* p. 332.

MESOGLOIA Hudsoni, *Harv. in Hook. Br. Fl.* vol. ii. p. 386 (*not of Ag.*). *Harv. in Mack. Fl. Hib.* part 3. p. 186. *Wyatt, Alg. Danm.* no. 99. *Harv. Man.* p. 47.

ULVA rubens, *Huds. Fl. Ang.* p. 571.

HAB. On stones, and the smaller Algæ, near low-water mark, and at a greater depth. Annual. Summer and autumn. Generally distributed round the British shores; more abundantly in the north. Lossiemouth, *Mr. Brodie.* Appin, *Capt. Carmichael.* Arran and Salt-Coats, *Rev. D. Landsborough.* Orkney, *Rev. J. H. Pollexfen, Lieut. Thomas, and Dr. Mc'Bain.* Sidmouth and Torbay, *Mrs. Griffiths.* Falmouth, *Miss Warren.* Jersey, *Miss White.* Aberfaw, *Mr. Ralfs.* Killiney and Kilkee, *W. H. H.* Howth, *Miss Gower.* North of Ireland, *Mr. Thompson.* Roundstone Bay, *Mr. Mc' Calla.*

GEOGR. DISTR. Northern Atlantic, as far south as the French shores of the British Channel. Baltic Sea.

DESCR. *Root* minute. *Fronds* densely tufted, 6–8 inches long, or more, about half a line in diameter, preserving an equal thickness throughout, with a simple or forked main stem, densely clothed with lateral branches. Lowest branches longest, the rest gradually shorter towards the apex, so that the outline is pretty regularly ovate, all very patent, horizontal or divaricate, in some specimens pretty regularly alternate, in others generally opposite, flexuous, pinnate or bi-pinnate, with divaricating lesser branchlets. *Ramuli* numerous, filiform, squarrose. *Substance* firmly gelatinous and elastic. *Colour* a pale red, or red-brown, becoming darker in the herbarium. *Favellæ* very commonly produced, imbedded in the whorled filaments of the periphery, to which they are attached. *Tetraspores* I have never seen.

This species is well known to British botanists as the *Mesogloia Hudsoni*, of the ' British Flora ', and is, I have little doubt, the plant intended by Hudson, under the name *Ulva rubens*; his description " U. gelatinosa filiformis ramosissima rubescens, ramis sparsis horizontalibus obtusis ", being strictly applicable. But it is not the plant called *Mesogloia Hudsoni* by Agardh, which it seems, is merely a variety of *Halymenia ligulata*; and it unquestionably is the species long known on the Continent under the name *Mesogloia divaricata*, and recently admitted into the genus *Dudresnaia*; a genus typified by *Mesogloia coccinea* and its allies. Though I consider it probable that Hudson was the original observer, still, as a doubt rests on his synonyme, I here adopt the modern name, given by Agardh, because it is that in common use, except in Britain.

It is still a question whether this plant really belongs to the genus *Dudresnaia*, and not rather to *Nemæleon*. If we judge it by outward habit it will be placed in the former; but there is certainly an approximation in structure to the latter, although the axis is less dense and somewhat differently constructed. The fructification is imperfectly known. I have sought in vain among a large number of specimens, from different localities, for tetraspores. Mrs. Griffiths has been equally unsuccessful. Nor has M. Chauvin, on the coast of Normandy, been more fortunate. All the specimens we have independently examined, produce *favellidia*, which appear to be formed in abundance on every full-grown plant. As this is also the case with *Nemæleon multifidum*, it may be questioned whether it would not be more correct to place *D. divaricata* in the same genus.

Dudresnaia divaricata abounds throughout the Northern Atlantic, gradually diminishing to the south of the British Islands. It has not been found in the Mediterranean.

Fig. 1. DUDESNAIA DIVARICATA:—*of the natural size.* 2. Transverse section of a segment of the frond. 3. Longitudinal section of the same:—*both highly magnified.*

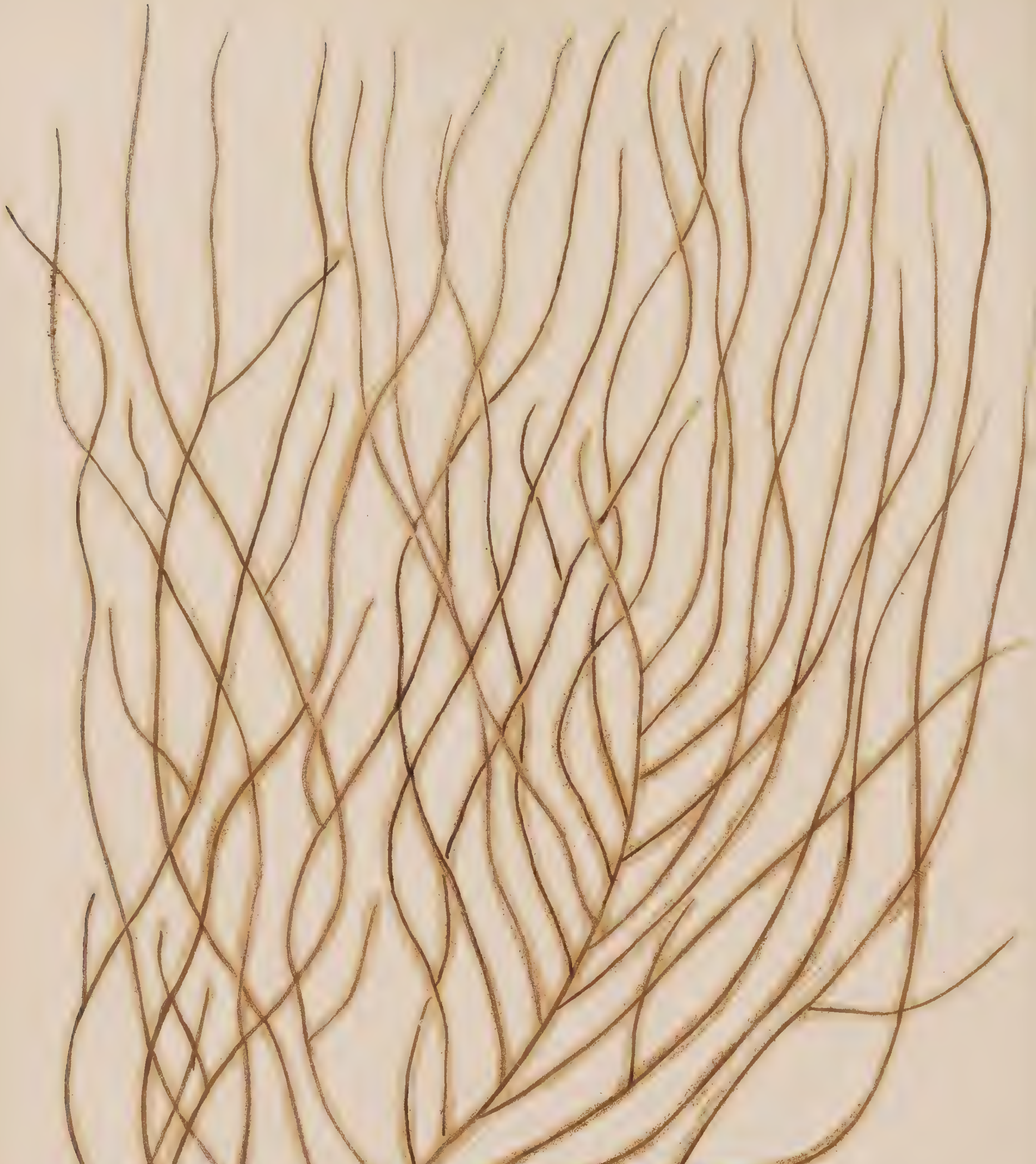


Plate CXI.

CHORDARIA FLAGELLIFORMIS, *Ag.*

Gen. Char. *Frond* filiform, much branched, cartilaginous, solid. *Axis* composed of densely packed, longitudinal, interlaced, cylindrical filaments; the periphery, of simple, club-shaped, horizontal, whorled filaments, and long, byssoid, gelatinous fibres. *Fructification* obovate spores, seated among the filaments of the periphery. Chordaria (*Ag.*),—from *chorda*, a *cord.*

Chordaria *flagelliformis*; frond subsimple, furnished with closely-set, long, simple, filiform branches, ramuli very few or none; filaments of the periphery club-shaped, the terminal cellule large or small.

Chordaria flagelliformis, *Ag. Syn.* p. 12. *Lyngb. Hyd. Dan.* p. 51. t. 13. *Ag. Sp. Alg.* vol. i. p. 166. *Ag. Syst.* p. 256. *Hook. Fl. Scot.* part 2. p. 98. *Grev. Fl. Edin.* p. 288. *Grev. Alg. Brit.* p. 44. t. 7. *Hook. Fl. Brit.* vol. ii. p. 275. *Harv. in Mack. Fl. Hib.* part 3. p. 183. *Harv. Man.* p. 45. *Wyatt, Alg. Danm.* no. 57. *Kütz. Phyc. Gen.* p. 332. t. 27. f. 3. *Endl.* 3rd *Suppl.* p. 23.

Gigartina flagelliformis, *Lamour. Ess.* p. 48.

Fucus flagelliformis, *Fl. Dan.* t. 650. *Turn. Syn.* vol. ii. p. 335. *Turn. Hist.* t. 85. *Sm. E. Bot.* t. 1222.

Hab. On rocks and stones in the sea, between tide-marks. Annual. Summer. Common on the shores of the British Islands.

Geogr. Distr. Abundant on the Atlantic shores of Europe, from Iceland to France. Eastern coast of North America. Cape of Good Hope.

Descr. *Root* a minute disc. *Fronds* tufted, from six inches to two or three feet in length, preserving throughout an uniform thickness, of about half a line, furnished with a simple or sparingly forked stem, which is densely clothed from its base to its summit with lateral branches, which issue at distances varying from a tenth to half an inch. *Branches* from six to twenty inches long, cord-like, perfectly simple, and generally naked; but now and then furnished with a few, filiform, often secund ramuli, widely distant from each other. In the young plant, the branches are very short, the stem often developing to its full extent, while the branches are rudimentary, in which state it may readily pass for a different species. *Spores* abundantly produced in the full-grown plant, formed at the base of the peripheric filaments. The structure of the axis is very dense and firm, composed of closely combined interlacing filaments. The filaments of the periphery vary in form as the plant advances in age; when young, they are club-shaped, but in age more or less capitate. *Colour* very dark brown. *Substance* cartilaginous, with a slimy coat. It closely adheres to paper, which it stains of a rusty colour.

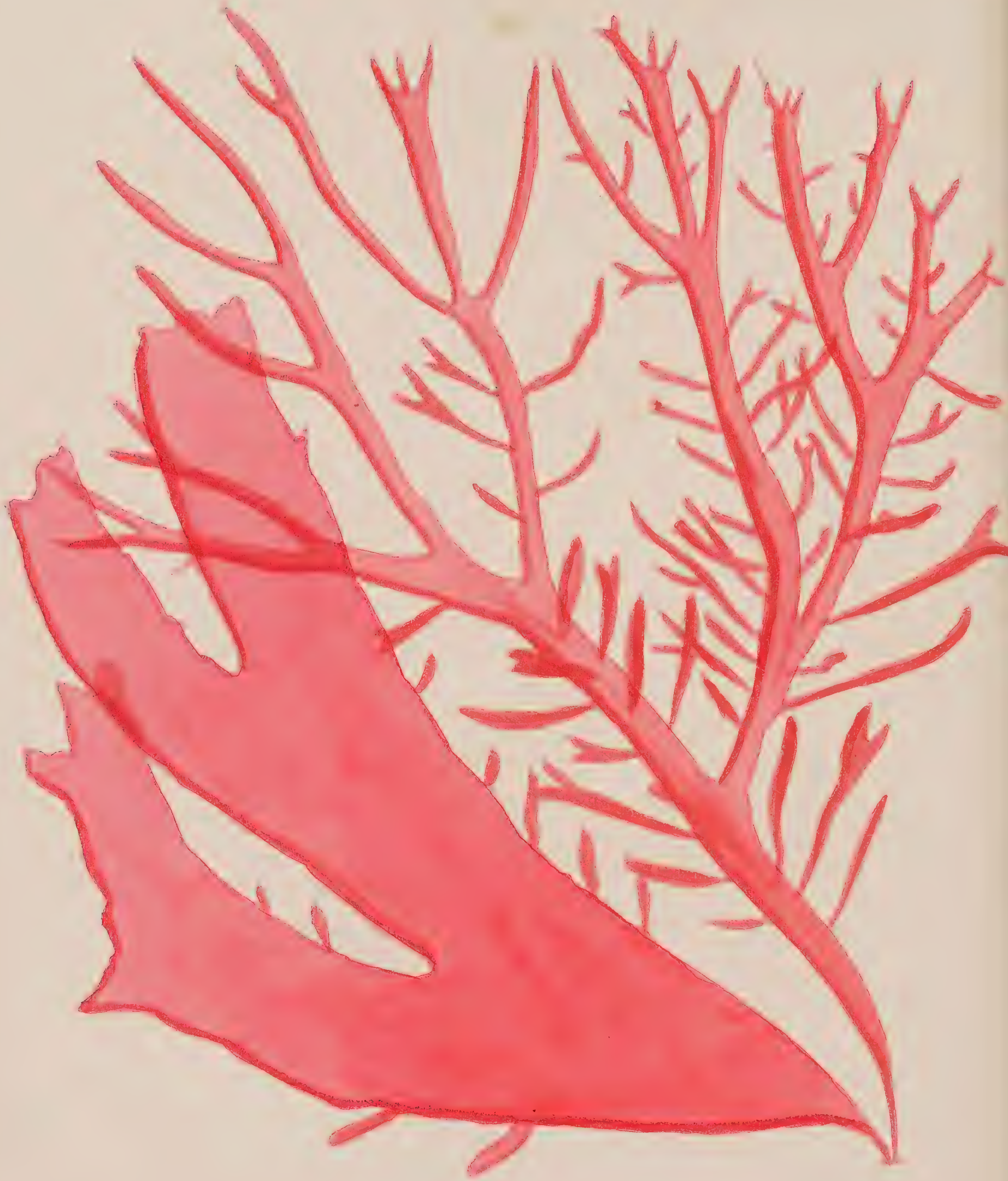
A very common plant in the North Atlantic, but strangely misunderstood by early writers, who confounded it with *Gracilaria confervoides*; a mistake which, with modern microscopes, it would be impossible to fall into. It was first clearly defined as a species, in the 'Flora Danica,' and was afterwards made the type of a distinct genus, which in modern systems, represents a separate family, widely parted from that to which *G. confervoides* belongs. The only resemblance between these plants is, that both have long, and often simple branches. Neither in structure, in substance, or in colour, is there any identity.

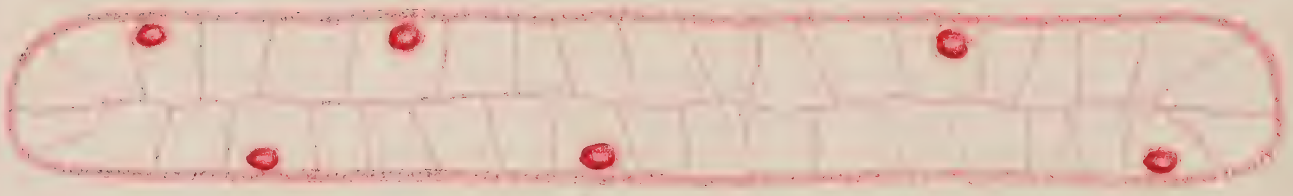
The fructification, which was first described by Turner, has been overlooked by many authors, and yet it is not unfrequently produced. I have generally found an abundance of spores in full-grown plants, gathered in the months of July and August. They may most easily be elicited by compressing a small part of a branch between two pieces of glass, and appear to exist in equal numbers in all parts of the plant.

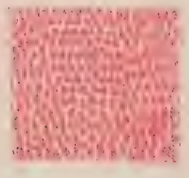
At Plate XVII. we have represented the only other British species of *Chordaria* yet discovered. By comparing the figure now given, with that plate, the differences and resemblances will be readily appreciated. In younger plants of *C. flagelliformis* the filaments of the periphery are exactly club-shaped; in more fully grown individuals, the terminal cellule is larger, and more resembles that of *C. divaricata* than I formerly supposed. But the difference in ramification is so great that there can be no difficulty in discriminating between these species.

Fig. 1. CHORDARIA FLAGELLIFORMIS:—*of the natural size.* 2. Part of a cross section of the frond. 3. Longitudinal section of the same. 4. Filaments of the periphery and spore. 5. A spore removed.

Pl. CXII







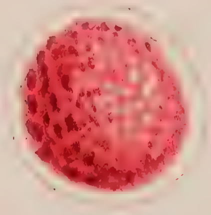


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PLATE CXII.

HALYMENIA LIGULATA, *Ag.*

GEN. CHAR. *Frond* compressed or flat, pinky red, gelatinoso-membranaceous, consisting of a delicate membrane, whose walls are separated by a very lax net-work of jointed fibres; cells of the membrane minute, coloured. *Fructification,* spherical masses of spores *(favellidia)* immersed in the frond, attached to the inner surface of the membranous periphery. HALYMENIA (*Ag.*),—from ἅλς, the *sea,* and ὕμην, a *membrane.*

HALYMENIA *ligulata*; frond compressed or flat, irregularly dichotomous or palmate, the segments attenuated, often proliferous at the margin.

HALYMENIA ligulata, *Ag. Sp. Alg.* vol. i. p. 210. *Ag. Syst.* p. 244. *Spreng. Syst. Veg.* vol. iv. p. 333. *Grev. Alg. Brit.* p. 162. t. 17. *Hook. Br. Fl.* vol. ii. p. 308. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 52. *Wyatt. Alg. Danm.* no. 425. *Endl. 3rd Suppl.* p. 40.

HALYMENIA elongata, *Ag. Sp. Alg.* vol. i. p. 209. *Ag. Syst.* p. 243. *J. Ag. Medit.* p. 98.

HALARACHNION ligulatum, *Kütz. Phyc. Gen.* p. 394. t. 74. f. 1.

ULVA ligulata, *Woodw. in Linn. Trans.* vol. iii. p. 54. *E. Bot.* t. 420.

ULVA rubra, *Huds. Fl. Ang.* p. 571. *E. Bot.* t. 1627.

MESOGLOIA Hudsoni, *Ag. Syst.* p. 50 (*not of British authors*).

HAB. On rocks and stones near low-water mark, rare; more usually dredged in 6–10 fathoms water. Annual. Summer. Frequent on the southern shores of England, in many places. Coast of Norfolk, *Mr. L. Wigg, Mr. Turner,* &c. Anglesea, *Rev. H. Davies.* East, south and western shores of Ireland. Very common in Jersey, *Miss White and Miss Turner.* Rare in Scotland; Orkney, *Rev. J. H. Pollexfen.*

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

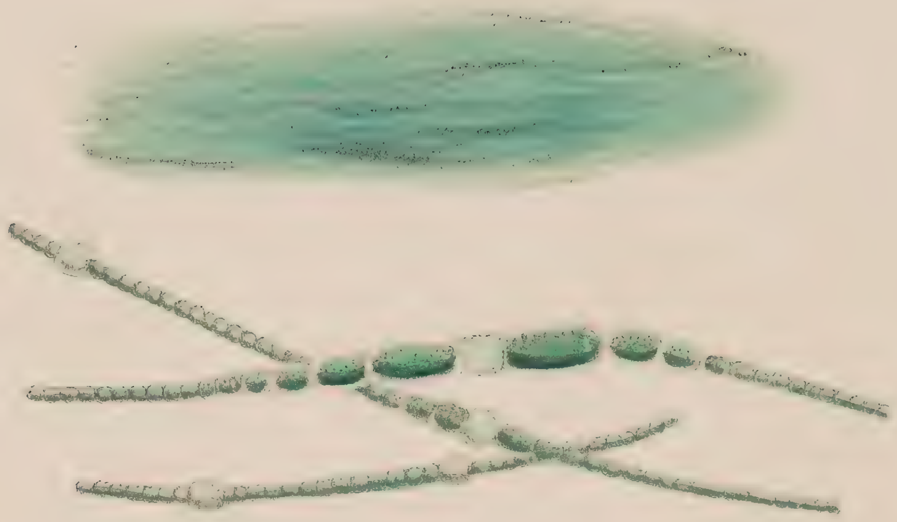
DESCR. *Root* small, scutate. *Frond* extremely variable in ramification, and even in substance, but resolvable into three principal varieties. *a. dichotoma*; frond six to eight inches long, from half a line to one or two lines broad, compressed, very gelatinous, many times divided in an irregularly dichotomous manner, the divisions nearly of equal breadth, becoming gradually narrower toward the extremities, which are acuminate. *β. ramentacea*; frond twelve to fourteen inches long, or more, half an inch in breadth, compressed, gelatinous, divided into three or four principal branches, from the sides of which issue very numerous, simple or occasionally forked *ramenta* constricted at base, tapering to an acute point, cylindrical or nearly so. Occasionally the ramenta are very thin, almost setaceous, and proportionably numerous and subdivided. *γ. latifolia*; frond twelve to twenty inches long, two to four inches wide, perfectly flat, stipitate, wedge-shaped, simple or forked, or irregularly palmate, of a darker colour, and less gelatinous substance than the two former varieties. *Colour* varying from a pale to a strong rose-red, or in the broad variety a deep red. *Substance* gelatinous and tender, very soft, elastic, and adhering to paper, shrinking very much in drying. *Fructification*, abundantly scattered through the whole substance of the frond, resembling minute dots.

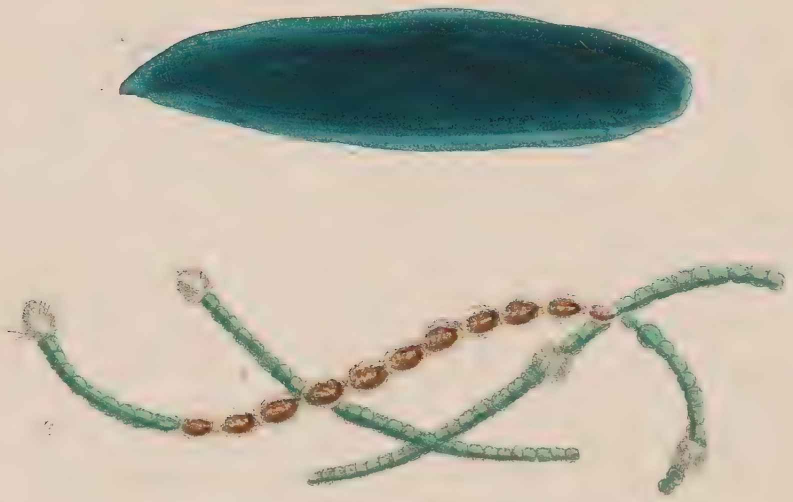
* * *

Though probably first noticed by Hudson, whose *Ulva rubra* we have quoted as a synonyme, this plant was first clearly described, and its characters defined by Woodward, in the 'Linn. Trans.' for the year 1797. Among British Algæ few exhibit wilder variations in form, and yet I have never known it to be mistaken by any person who has once had the advantage of seeing it in a living state. The pinky colour, and peculiarly soft substance, between gelatinous and membranaceous, and the innumerable dots of fructification are found in every specimen, and sufficiently mark the species. In form and size, there is extraordinary variety. The specimens we have selected for illustration, unlike as they are, are only very moderately different, compared to some others which exist in our herbarium. And yet an extensive suite of forms exhibits so perfect a gradation from the narrowest and most compound, to the broadest and most simple, that it is impossible to fix exactly the limits where one variety ends, and another begins. That all, therefore, belong to one species, is generally allowed.

Possibly the *H. elongata* of Agardh, of which I have seen no authentic specimen, may be, as Prof. J. Agardh states, a distinct plant. But the specimens which I possess under this name, are certainly only a narrow form of *H. ligulata*, such as is frequently found on the south coast of England. Our variety γ, *latifolia*, in its typical form, has much more the characters of a species, distinguished by a thinner and more compact substance, and a darker colour.

Fig. 1. HALYMENIA LIGULATA, var. β. and γ., small specimens :—*of the natural size*. 2. A transverse section of the frond. 3. Portion of the membranous wall. 4. A favellidium. 5. Spores.





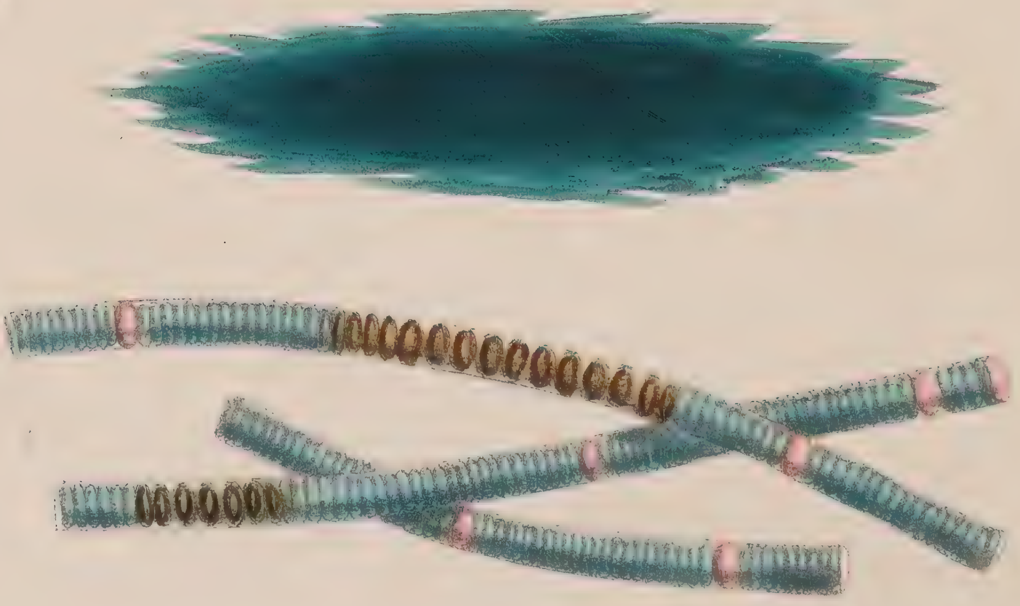


PLATE CXIII. *A.*

SPHÆROZYGA CARMICHAELII, *Harv.*

GEN. CHAR. "*Filaments* free, simple, moniliform, consisting of a series of ordinary cells interrupted here and there by a cell of a different kind (*connecting-cell*), which is generally of a larger size, and often ciliated." *Thw.* Spores formed from the ordinary cells. SPHÆROZYGA (*Ag.*),—σφαῖρα, a *sphere*, and ζῦγος, a *yoke*. The name *Anabaina*, applied to this genus by Bory, is pre-occupied for a genus of *Euphorbiaceæ*, by A. de Jussieu.

SPHÆROZYGA *Carmichaelii*; "spores large, oblong, twice or thrice as long as broad, commencing to be formed from the cells nearest the connecting one." *Thw. in litt.*

BELONIA torulosa, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. ii. p. 379. *Harv. Man.* p. 167.

ANABAINA marina, *Breb. in An. Sc. Nat.*

HAB. On decaying heaps of marine Algæ, also in ditches of brackish water. Appin, *Capt. Carmichael.* Near the Menai bridge; also at Barmouth, and Penman Pool, near Dolgelley, *Mr. Ralfs.* Shorehampton, near Bristol, *Mr. G. H. K. Thwaites.*

GEOGR. DISTR. Probably throughout Europe.

DESCR. "In the beginning of autumn, vast quantities of filamentous Algæ are detached from their places of growth, and deposited here and there along the shore in extensive fleeces. When these fleeces begin to decay, this plant makes its appearance in the form of a very thin gelatinous pellicle, of a vivid green colour, spreading over the surface of the decaying mass. The pellicle is made up of straight" (or slightly curved), "brittle, moniliform filaments, one fourth of a line in length, and tapering at both ends." *Carm.* Spores of considerable size, remaining green, or assuming a brownish colour, when mature.

I have compared specimens of *Anabaina marina*, Breb., received from Messrs. Ralfs and Thwaites, with Carmichael's original *Belonia torulosa*; and find them to agree in every essential particular. This plant is unquestionably a *Sphærozyga*, to all the individuals of which genus the specific name "*torulosa*," which has the priority, is equally applicable. I have therefore dedicated this curious and beautiful parasite to the memory of its first discoverer, whose patient investigation of Cryptogamic plants has added so much to our knowledge of the more minute kinds.

A. Fig. 1. SPHÆROZYGA CARMICHAELII; appearance of the mass. 2. Filaments:—*magnified.*

PLATE CXIII. *B.*

SPHÆROZYGA THWAITESII, *Harv.* (*n. sp.*)

SPHÆROZYGA *Thwaitesii*; "spores elliptical, once and a half as long as broad, commencing to be formed from the cells most distant from the ciliated (*connecting*) one." *Thw. in litt.*

ANABAINA Thwaitesii, *Harv. MS.*

HAB. On the muddy sides of ditches of brackish water, also floating. Dolgelly, *Mr. Ralfs.* Shorehampton, near Bristol, *Mr. G. H. K. Thwaites.* Porbury, Somerset, *Mr. Broome.*

GEOGR. DISTR. Probably in similar situations throughout Europe.

DESCR. "Very gelatinous, deep green, sometimes almost black. *Filaments* pale green, curved, entangled; *connecting cells* large, ciliated, subspherical, slightly oblong, of a lighter colour than the ordinary cells, which are somewhat compressed. *Spores* of a deep brown, when mature." *Thw. in litt.*

My first acquaintance with this little plant was from a beautifully mounted specimen, communicated by G. H. K. Thwaites, Esq., of Bristol, to whom I am indebted for valuable notes and sketches of the three species now figured, without which assistance I should scarcely have ventured to publish them. I wish it therefore to bear the name of this gentleman, though I have since learned that it was originally detected by Mr. Ralfs, who has also, with his usual kindness, favoured me with notes and remarks. Mr. Thwaites observes that the *connecting* cell, which in this species is ciliated, is generally placed at or near the end of the filament, a peculiarity also noticed in *Anabaina velutina*, Breb., and in some others of this genus.

B. Fig. 1. SPHÆROZYGA THWAITESII; appearance of the mass. 2. Filaments: *magnified.*

PLATE CXIII. *C.*

SPERMOSIRA LITOREA, *Kütz.*

GEN. CHAR. "*Filaments* slightly mucous, free, simple, cylindrical, enclosed in a very delicate, membranous tube. *Cells* lenticular; *connecting cells* larger, compressed." *Thw.* *Spores* formed from the ordinary cells. SPERMOSIRA (*Kütz.*),—from σπέρμα, a *seed,* and σειρὰ, a *chain.*

SPERMOSIRA litorea, *Kütz. Phyc. Gen.* p. 213.

HAB. In muddy brackish ditches, with the preceding. Barmouth, *Rev. T. Salway.* Dolgelly, &c., *Mr. Ralfs.* Shorehampton, *Mr. G. H. K. Thwaites.*

GEOGR. DISTR. Probably throughout Europe, in similar situations.

DESCR. "Scarcely gelatinous, forming a deep green fleecy covering to floating plants, on which it occurs. *Filaments* of considerable diameter, nearly straight. Ordinary cells of a beautifully blue-green colour, very short and compressed, giving the filaments the appearance of an *Oscillatoria*; *connecting cells* of a pale reddish, but sometimes the plant is of an uniform dull green." *Thw. in litt.* *Spores* elliptical, at length acquiring a deep brown colour.

It will be seen by the figure, that the presence of a membranous tube to the filament, alone distinguishes this genus from *Sphærozyga.*

C. Fig. 1. SPERMOSIRA LITOREA; appearance of the mass. 2. Filaments:—*magnified.*

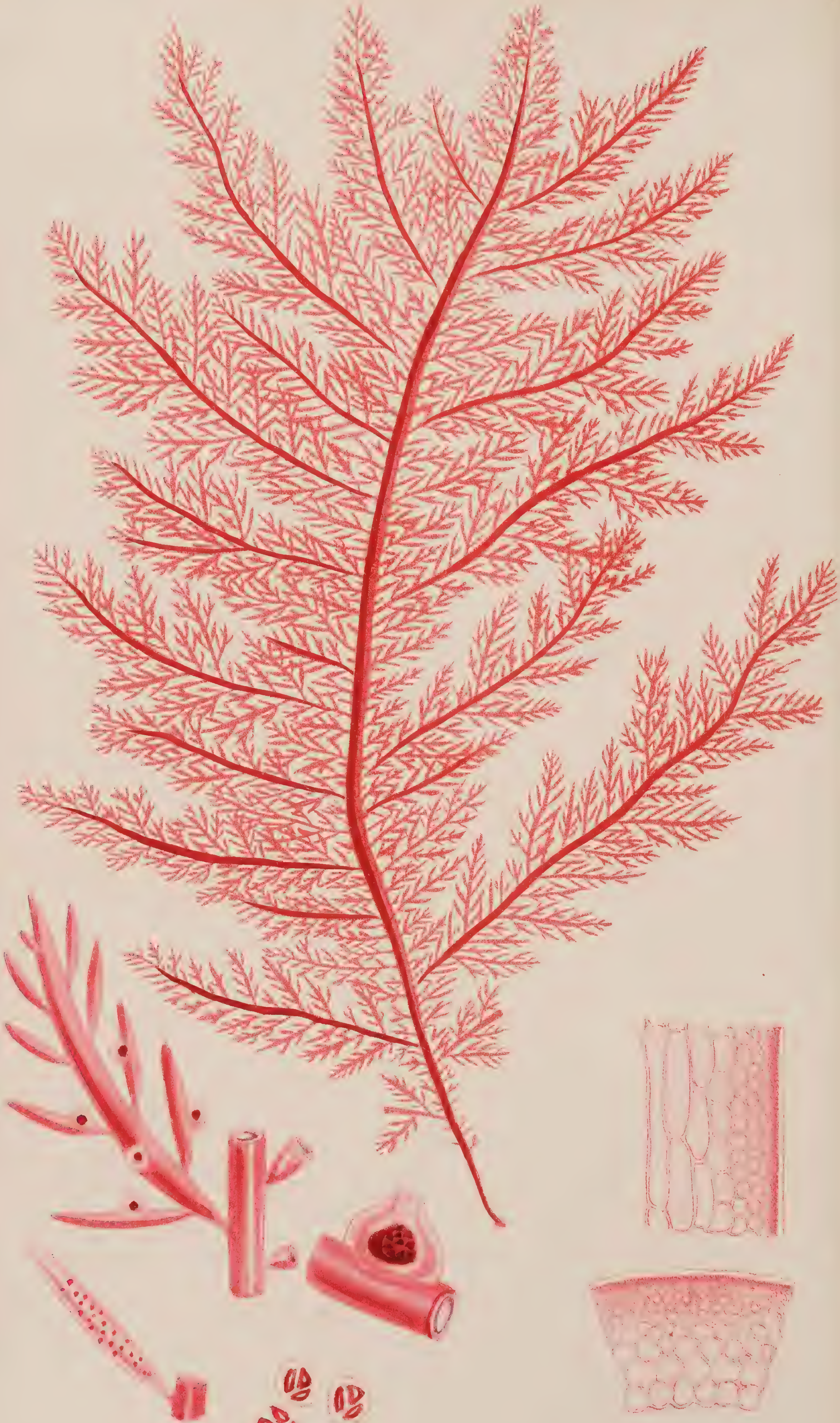


PLATE CXIV.

CHRYSYMENIA CLAVELLOSA, *J. Ag.*

GEN. CHAR. *Frond* tubular, continuous (not constricted or jointed), filled with a watery juice, and traversed by few longitudinal filaments; its walls composed of several rows of cells, the innermost of which are distended and much elongated, the outer gradually smaller, and the ultimate very minute. *Fructification* of two kinds, on distinct individuals; 1, ovate or conical *capsules (ceramidia)* containing a dense mass of angular spores, fixed to a central placenta. 2, triparted *tetraspores* immersed in the ramuli. CHRYSYMENIA (*J. Ag.*),—from χρυσεος, *golden,* and ’υμην, a *membrane*; because the species acquire golden tints if long steeped in fresh water.

CHRYSYMENIA *clavellosa*; frond gelatino-membranaceous, very much branched in a repeatedly pinnate manner, branches of various lengths, mostly distichous; ramuli distichous or quadrifarious, attenuated at base; capsules conical.

CHRYSYMENIA clavellosa, *J. Ag. Medit.* p. 107. *Endl. 3rd Suppl.* p. 42.

CHONDROTHAMNION clavellosum, *Kütz. Phyc. Gen.* p. 438. t. 53. f. 2.

CHONDROTHAMNION confertum, *De Not.*

CHYLOCLADIA clavellosa, *Hook. Br. Fl.* vol. ii. p. 297. *Wyatt, Alg. Danm.* no. 23. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 71.

GASTRIDIUM clavellosum, *Lyngb. Hyd. Dan.* p. 70. t. 17. *Grev. Alg. Brit.* p. 115.

GASTRIDIUM purpurascens, *Lyngb. l. c.* p. 69. t. 17.

CHONDRIA clavellosa, *Ag. Sp. Alg.* vol. i. p. 353. *Ag. Syst.* p. 206. *Hook. Fl. Scot.* part 2. p. 105. *Grev. Fl. Edin.* p. 291. *Spreng. Syst. Veg.* vol. iv. p. 342.

GIGARTINA clavellosa, *Lamour. Ess.* p. 49.

FUCUS clavellosus, *Turn. in Linn. Trans.* vol. vi. p. 133. t. 9. *Turn. Syn.* p. 373. *Turn. Hist. Fuc.* t. 30. *Sm. Eng. Bot.* t. 1203.

HAB. On rocks, stones, and parasitical on the smaller Algæ near low-water mark; also on the stems of *Laminariæ*, at a greater depth. Annual. Spring and summer. Found on all the British coasts from Orkney to Cornwall. Jersey.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain. Baltic Sea. Mediterranean Sea. Tasmania.

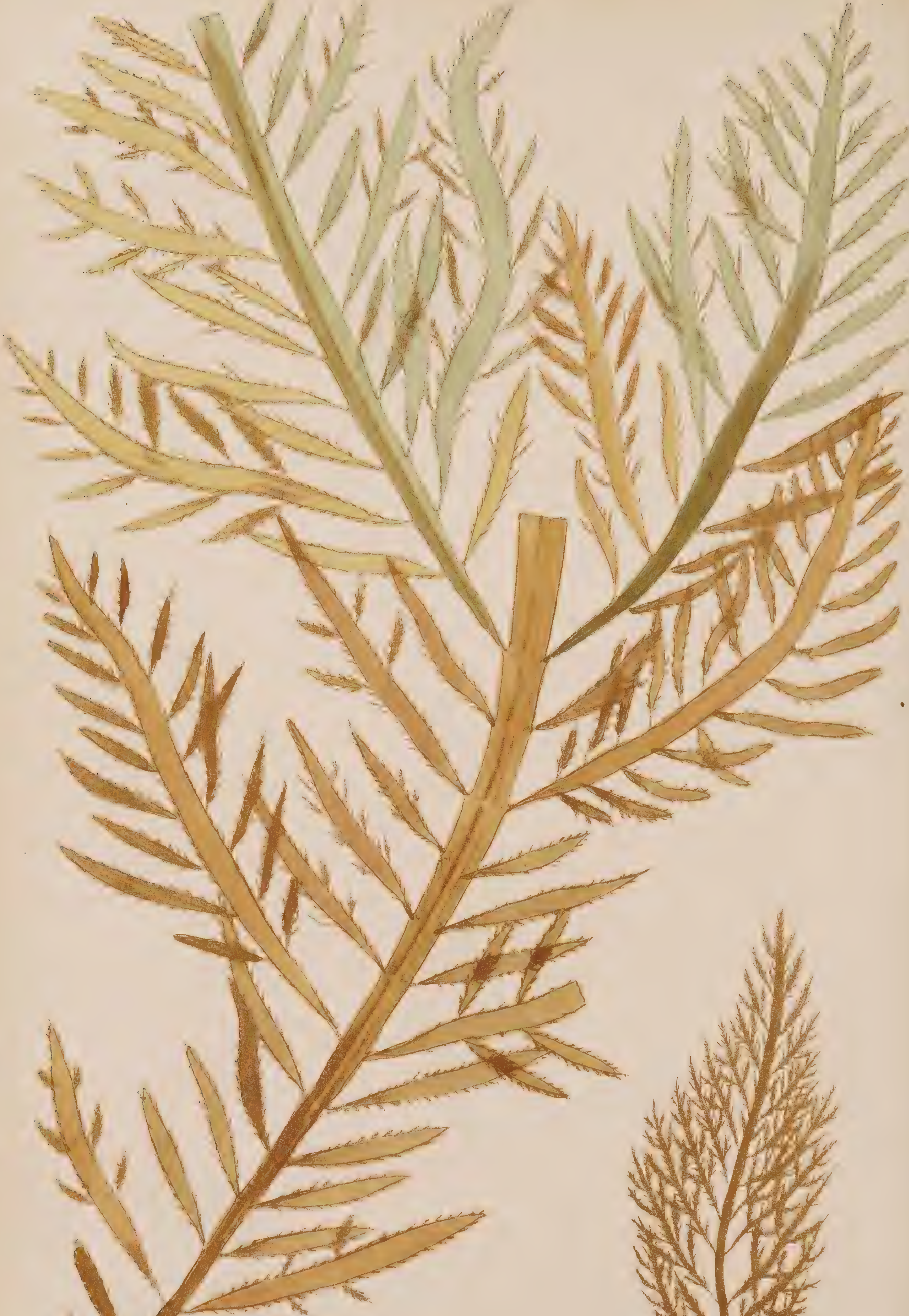
DESCR. *Root* a minute conical disc. *Fronds* from three to twelve or fourteen inches long, from a quarter of a line to nearly two lines in diameter, with a generally undivided principal stem, which gradually widens from the base to the middle, and then tapers towards the apex. This stem is closely beset from a short distance above its base to its extremity, with lateral, patent, opposite or alternate, generally distichous branches, of very various lengths, and having a lanceolate outline, which are in like manner pinnated with a second, third or even fourth series of smaller branches or ramuli, the last of which are from one to two or three lines long, spindle-shaped, and subacute. Always when young, and very generally in all stages, the ramuli are, like the other parts of the frond, distichous; but sometimes they are excessively crowded, much divided, and issuing from all sides of the branches. In some varieties the main stem is nearly naked, with a few very long virgate branches, much longer than itself, which are clothed with slightly compound ramuli, half an inch long; in others the main branches and their divisions are so densely crowded, so excessively compound, and so frequently quadrifarious, that the whole frond becomes a matted ball, so dense that it is difficult to trace its branching. *Substance* tender, soon decomposing in fresh water. *Colour* a beautiful pinky red, which becomes rather darker in drying.

Chrysymenia clavellosa was first described by Mr. Turner, in the sixth volume of the 'Linnæan Transactions', where a figure is given, but was known, as this author informs us, to the excellent Lightfoot, who proposed to describe it under the specific name bestowed upon it by Mr. Turner. It also appears to have been in some respects known to Hudson, in whose herbarium specimens are preserved. But previously to the publication of Mr. Turner's memoir, it was very commonly regarded as a state of *Chylocladia kaliformis*, a plant of a different structure, and different ramification.

By the younger Agardh it is made the type of a new genus, to which several exotic species are also referable, distinguished from *Chylocladia*, under which Dr. Greville included this group, by the absence of internal diaphragms dividing the branches of the frond into distinct joints. This character is accompanied by some difference in habit, and some minor details of structure, and may be admitted as sufficient. But I cannot so readily concur with my friend Agardh in removing *Chrysymenia* from the *Chondrieæ* to the *Coccocarpeæ*. The nature of the fructification, and, as it appears to me, the whole structure of the frond are those of *Chondrieæ*. In *Chrysymenia*, indeed, the *ceramidia* are even more perfectly formed than in some species of *Chylocladia*.

A specimen of *Chondrothamnion confertum*, De Not., communicated by M. Lenormand, is certainly nothing more than a young and densely branched individual of the present species, such as one commonly finds in spring or early summer. It is a pity that the founders of new species are not always sufficiently careful to observe the changes which these plants undergo at different seasons, and the modifications to which they are subject from circumstances attending their production.

Fig. 1. CHRYSYMENIA CLAVELLOSA:—*of the natural size.* 2. A small branch, bearing capsules. 3. A section of a ramulus, with its capsule. 4. A ramulus with tetraspores. 5. Tetraspores. 6. A longitudinal section of the wall of the frond. 7. A transverse section of the same:—*all more or less magnified.*



W H H. del et lith

Reeve imp

PLATE CXV.

DESMARESTIA LIGULATA, *Lamour.*

GEN. CHAR. *Frond* linear, either filiform, compressed or flat, distichously branched, cellular, traversed by an internal, single-tubed jointed filament; producing, when young, marginal tufts of byssoid, branching fibres. *Fructification* unknown.—DESMARESTIA (*Lamour.*), in honour of *A. G. Desmarest*, a celebrated French naturalist.

DESMARESTIA *ligulata*; frond flat, with an obscure mid-rib, repeatedly pinnate; pinnæ and pinnulæ opposite, linear-lanceolate, tapering towards both extremities.

DESMARESTIA ligulata, *Lamour. Ess.* p. 25. *Grev. Alg. Brit.* p. 37. t. 5. *Hook. Br. Fl.* vol. ii. p. 273. *Harv. in Mack. Fl. Hib.* part 3. p. 172. *Harv. Man.* p. 26. *Wyatt, Alg. Danm.* no. 55. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 343.

DESMIA ligulata, *Lyngb. Hyd. Dan.* p. 33. t. 7.

SPOROCHNUS ligulatus, *Ag. Sp. Alg.* vol. i. p. 158. *Ag. Syst.* p. 261. *Grev. Fl. Edin.* p. 287. *Spreng. Syst. Veget.* vol. iv. p. 330.

LAMINARIA ligulata, *Hook. Fl. Scot.* part 2. p. 99.

FUCUS ligulatus, *Lightf. Fl. Scot.* p. 946. t. 29. *Turn. Syn.* p. 99. *Turn. Hist. Fuc.* t. 98. *Sm. E. Bot.* t. 1636.

FUCUS herbaceus, *Huds. Fl. Ang.* p. 582.

HAB. On the rocky bottoms of sub-marine tide-pools, near low water mark; and at a greater depth. Annual. Summer. Not uncommon on the shores of the British Islands from Orkney to Cornwall. Jersey.

GEOGR. DISTR. European Atlantic, from the shores of the Fœroe Islands to the coast of France. Cape Horn, *Dr. Hooker.*

DESCR. *Root* a large conical expansion, half an inch broad. *Fronds* from two to six feet long or more, with a short, cylindrical, cartilaginous stem from half a line to a line in diameter, which soon becomes compressed, and at the distance of an inch or two from the base passes into the flat, linear, undivided frond, which gradually widens to its middle, and from thence is attenuated to the apex: this primary frond is from one to four lines wide, furnished with a more or less evident mid-rib, and closely pinnated, at distances varying from an eighth of an inch to upwards of an inch, with opposite, distichous branches. *Branches* very variable in length, the long and short ones mixed together without order; the smaller ones simple, from half an inch to an inch long, resembling lanceolate leaves; the larger pinnate or bipinnate, all the divisions being of a lanceolate form, but varying much in relative breadth in different specimens, sometimes not one third of a line in breadth, sometimes three or four lines. All the pinnules are margined with minute spine-like teeth, which in young individuals produce tufts of delicate, branching, jointed fibres. *Fructification* unknown. *Sub-*

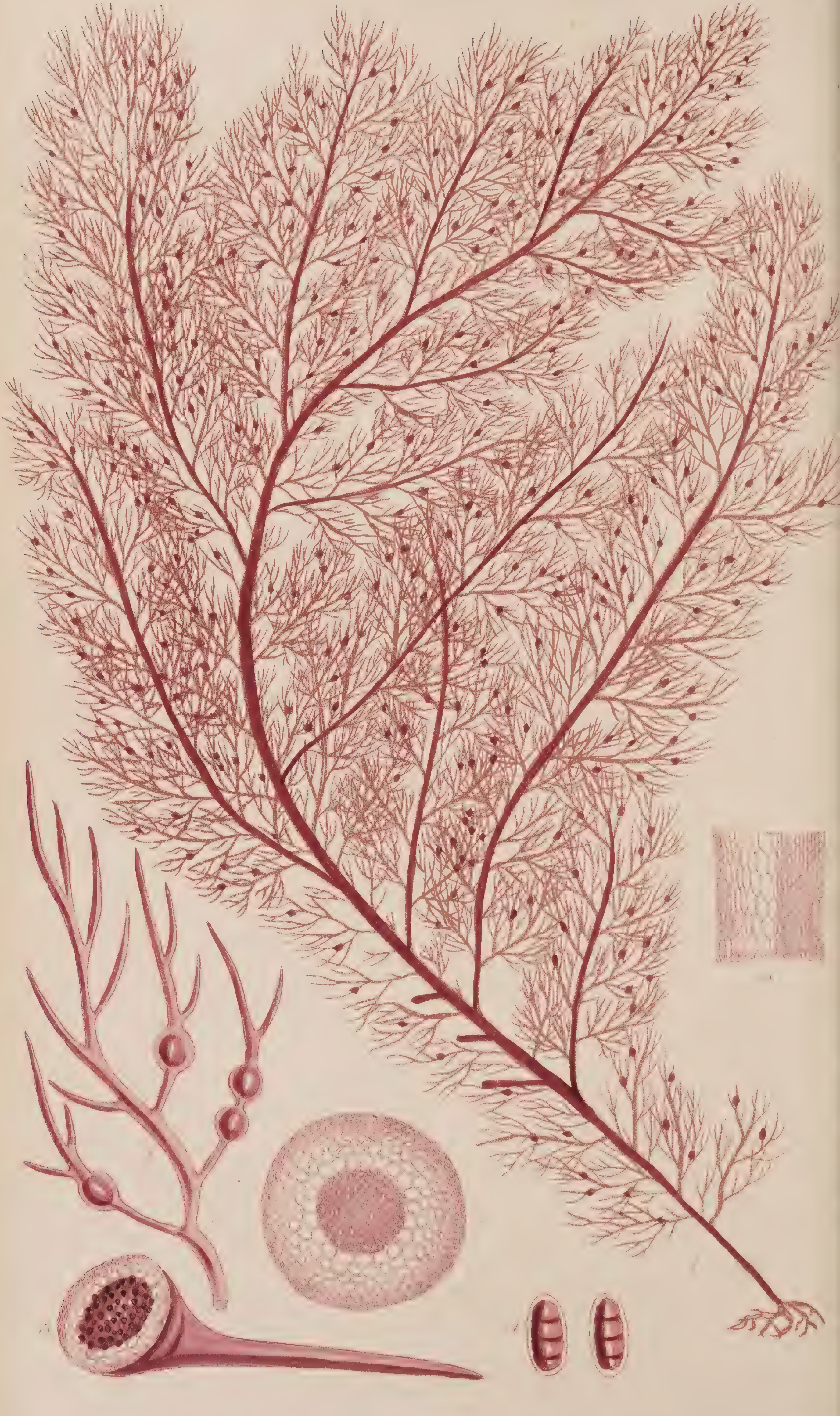
stance at first cartilaginous, firm and elastic, but soon, on removal from the water, becoming flaccid. *Colour*, when growing, a clear olive brown, soon becoming verdigris green in the air, and when preserved in the herbarium usually a yellowish olive.

A very elegant plant, one of the most beautiful of our olive coloured Algæ, and not uncommon on any of the British shores. It was first described by Lightfoot in his 'Flora Scotica,' where an excellent figure is also given. With a perfect regularity in its branching, and in all the lesser details of its habit, there is so much difference in the relative breadth of the frond, that specimens from different parts of the coast have a very opposite aspect. In some the branches are broader than our larger figure represents, and these approach the narrower forms of the exotic *D. herbacea*, whose broader varieties have branches as wide as the laciniæ of a *Laminaria*; in others the frond is so narrow, that, as Mr. Turner well observes, such individuals may, at first sight, be mistaken for luxuriant fronds of *D. viridis*, whose narrower varieties are as delicate as the finest *Confervæ*. One would scarcely expect this close connection by comparing merely typical states of these three species, but by an extensive suite of specimens the approximation may be very clearly shown, but it never arrives at the point where one absolutely passes into the other.

Desmarestia ligulata is widely distributed in the Northern Atlantic, and probably as common on the American as the European side, though we have as yet no evidence of the fact. In the southern hemisphere I am only aware of its having been found at Cape Horn, where Dr. J. D. Hooker dredged, from a considerable depth, specimens in all respects similar to British individuals. This fact is the more interesting because the same locality furnishes another closely analogous, but perfectly distinct species, *D. Rossii*, which, but for the presence of the true *D. ligulata*, one would be inclined to regard as its representative.

Fig. 1. DESMARESTIA LIGULATA, part of a frond. 2. A branch of a narrower individual:—*both of the natural size.* 3. A cross section of the lower part of the frond:—*magnified.*

PL. CXVI.



W. H. H. del et lith

Reeve imp

PLATE CXVI.

HYPNEA PURPURASCENS, *Harv.*

GEN. CHAR. *Frond* filiform, cartilaginous, continuous, much branched, cellular; with a dense, more or less evident fibro-cellular axis, surrounded by several rows of angular cells, the innermost of which are largest, the outer gradually smaller to the circumference. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia),* sessile or immersed in the ramuli, containing a mass of small spores on a central placenta; 2, transversely parted *tetraspores* imbedded in the cells of the surface. HYPNEA (*Lamour.*),—an alteration of *Hypnum,* the name of a genus of Mosses, in allusion to the mossy character of some of the original species.

HYPNEA *purpurascens;* frond dull purplish-red, excessively and irregularly branched, bushy, cartilaginous, soft; branches alternate, elongate, densely clothed with slender, many times divided branchlets, whose ultimate divisions are setaceous; tubercles spherical, immersed in the ramuli.

GRACILARIA purpurascens, *Grev. Alg. Brit.* p. 122.

PLOCARIA purpurascens, *Endl. 3rd Suppl.* p. 51.

CYSTOCLONIUM purpurascens, *Kütz. Phyc. Gen.* p. 404. t. 58. f. 1.

GIGARTINA purpurascens, *Lamour. Ess.* p. 136. *Lyngb. Hyd. Dan.* p. 46. t. 12. *Grev. Fl. Edin.* p. 290. *Hook. Br. Fl.* vol. ii. p. 299. *Harv. in Mack. Fl. Hib.* part 3. p. 200. *Harv. Man.* p. 73. *Wyatt, Alg. Danm.* no. 74.

SPHÆROCOCCUS purpurascens, *Ag. Sp. Alg.* vol. i. p. 318. *Ag. Syst.* p. 236. *Spreng. Syst. Veg.* vol. iv. p. 339. *Hook. Fl. Scot.* part 2. p. 134. *Fl. Dan.* t. 1835.

FUCUS purpurascens, *Huds. Fl. Ang.* p. 589. *Sm. E. Bot.* t. 1243. *Turn. Syn.* p. 357. *Turn. Hist. Fuc.* t. 9.

FUCUS tuberculatus, *Lightf. Fl. Scot.* p. 226.

Var. β. *cirrhosa;* irregularly branched and variously distorted, the branches zig-zag, here and there swollen, the apices lengthened into tendrils, which coil round the stems of neighbouring plants.

FUCUS tuberculatus, β, *Lightf. Fl. Scot.* p. 927.

GIGARTINA purpurascens, β, cirrhosa, *Lyngb. Hyd. Dan.* p. 46.

HAB. On rocks and stones, within tide marks. Very common on all the British shores. Annual. Summer.

GEOGR. DISTR. Atlantic shores of Europe and North America.

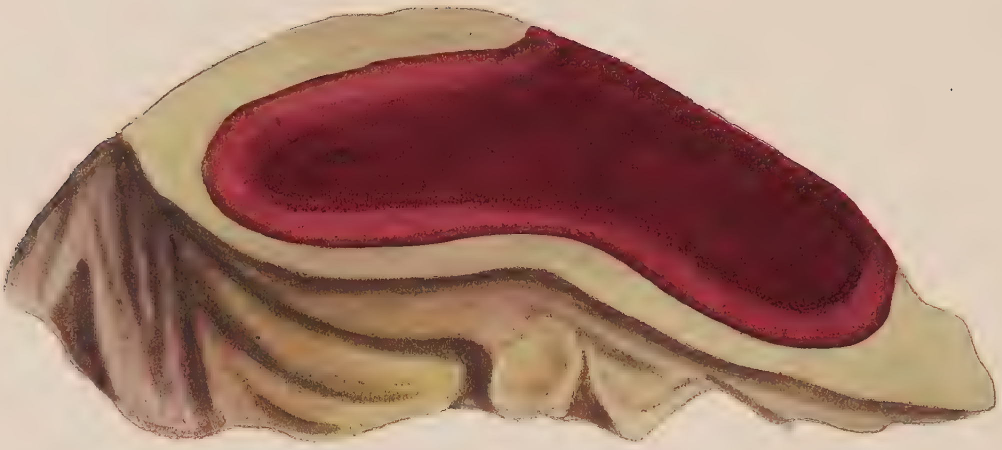
DESCR. *Root* fibrous. *Fronds* from six inches to two feet in length, cylindrical, as thick as a crow's quill at base, slightly widening towards the middle, and again tapering to the apex, very much branched and bushy. Main stem either undivided, but furnished with numerous alternate lateral branches; or irregularly forked, and gradually dissipated in the bushy frond; branches long, simple or compound, much attenuated, more or less densely clothed with quadrifarious multifid branchlets, from one to two inches in length, alternately divided. *Ramuli* setaceous, acute, slightly tapering at the base. *Tubercles* abundant, forming a spherical swelling in the middle of the ramuli, one or more in each ramulus. *Tetraspores* oblong, divided by three transverse lines, into four parts, vertically immersed among the cells of the surface, dispersed through the smaller branches and ramuli. *Substance* cartilaginous, soft, imperfectly adhering to paper. *Colour* a dull purplish-pink, often pale; becoming much darker in drying.

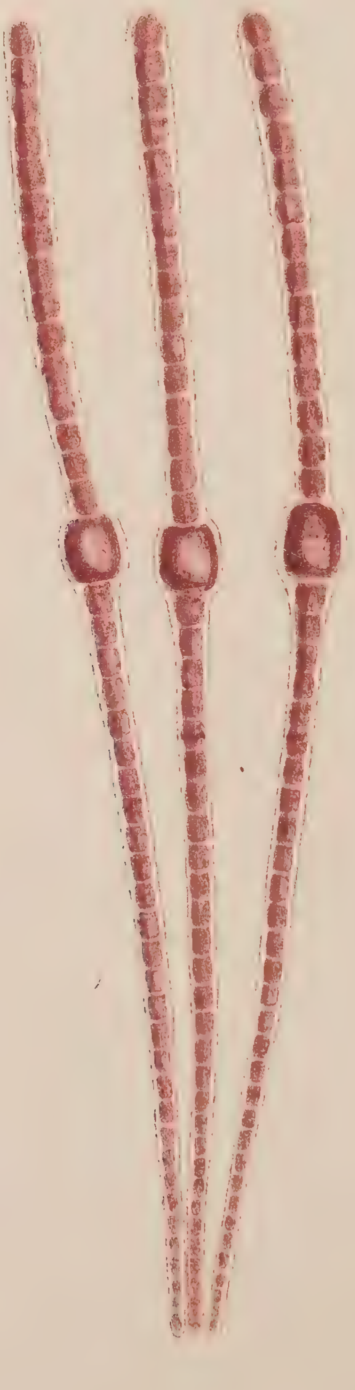
The genera *Hypnea* and *Gracilaria* are, as I have already noticed in the remarks under Plate LXV., very closely allied to each other, but the character derived from the tetraspores, there pointed out, will not serve to distinguish them, for I have since ascertained that annular tetraspores exist in most of the *Gracilariæ*, as well as in *Hypnea.* If the two genera are to be maintained we must look for other distinctions, and these may be most readily found in the structure of the frond, the true *Gracilariæ* having an axis composed of very large cells; the *Hypneæ* having a more or less evident fibro-cellular axis, composed of minute, elongated cells. The calibre of this axis varies greatly in the different species, in some of which it exists like a thread; in others, as in the present species, it is of great size, and the cells by which it is surrounded are of much smaller dimensions than in the typical *H. musciformis.* Kützing, indeed, forms a new genus, which he calls *Cystoclonium* for our *H. purpurascens.* In this step I am not disposed to follow him, because it appears to me that the difference in structure is more one of degree, than of kind; and because the cirrhose habit of our var. β. indicates a close relationship with the *Hypneæ,* most of which produce similar tendrils.

Hypnea purpurascens is among the commonest of our Algæ, very variable in appearance, and very widely dispersed through the North Atlantic. If allowed to retain its place, it is the most northern example of the genus, none others being found north of the Mediterranean.

Fig. 1. Hypnea purpurascens:—*of the natural size.* 2. Portion of a ramulus. 3. Section of a tubercle. 4. Tetraspores. 5. Cross section of the frond 6. Longitudinal semi-section of the same:—*all magnified.*

CXVII.





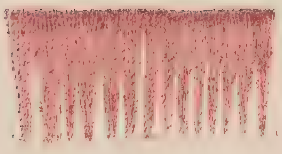


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PLATE CXVII.

CRUORIA PELLITA, *Fries*.

GEN. CHAR. *Frond* gelatinoso-coriaceous, forming a skin on the surface of rocks, composed of vertical, tufted, simple, jointed filaments, set in a gelatinose matrix; one of the joints of each filament larger than the rest. *Fructification*, tetraspores lying at the base of the filaments. CRUORIA (*Fries*),—from *cruor*, *blood*; because the plant looks like a blood-stain on the rock.

CRUORIA *pellita*.

CRUORIA pellita, *Fries, Fl. Scan.* p. 316. *Endl. 3rd Suppl.* p. 23. *Aresch. in Linn.* vol. 17. p. 267.

CHÆTOPHORA pellita, *Lyngb. Hyd. Dan.* p. 193. t. 66. *Berk. Gl. Br. Alg.* t. 1. f. 3. *Harv. in Hook. Br. Fl.* vol. ii. p. 390. *Harv. in Mack. Fl. Hib.* part 3. p. 223. *Harv. Man.* p. 123. *Fl. Dan.* t. 1728.

CHÆTODERMA pellita, *Kütz. Phyc. Gen.* p. 326.

HAB. On smooth exposed rocks and stones, between tide marks. Perennial. Fruiting in February, *Carm.* Common on the British shores, but frequently over-looked, Appin, *Capt. Carmichael.* Oban, *Rev. M. J. Berkeley.* West of Ireland, very abundant, *W.H.H.* Mounts Bay and Ilfracombe, *Mr. Ralfs.* Jersey, *Miss Turner.*

GEOGR. DISTR. Atlantic coasts of Europe, from Norway to France. Fœroe Islands.

DESCR. *Fronds* spreading over the surface of naked rocks, forming smooth, glossy patches of from two to three or more inches in diameter, at first nearly circular, but becoming irregularly lobed and sinuated at the margin when old, about half a line thick, tenacious, very elastic, between gelatinous and leathery, entirely composed of vertical filaments set in a firm, transparent jelly. *Filaments* fasciculate, perfectly simple, jointed, appearing, under a low power, moniliform, owing to the extreme transparency of their tube, composed of numerous joints filled with dense, coloured matter; joints about equal in length and breadth. Near the centre of every filament a large cellule occurs, thrice the diameter of the rest, but seemingly not otherwise differing, which, perhaps, performs some important office in the economy of the plant, though its functions are wholly unknown. *Fructification* (which I have not seen), apparently very rare, consisting of obovate clavate tetraspores, lodged at the base of the filaments. *Colour* of the frond a brownish red, or sometimes greenish or variously clouded with olive; of the filaments, under the glass, a pale or purplish-red.

Where a considerable surface of naked and smooth rock is exposed between tide marks, it may commonly be observed to be covered here and there with skin-like patches of a dull red or olive green, formed by the plant here figured, which adheres so closely to the surface of the rock that it can only be removed in flakes by scraping with a knife. It was first noticed on the shores of Norway and the Fœroe Islands, and has since been found in many places along the Atlantic coasts of Europe, and probably exists in many others where hitherto it has been overlooked. I have vainly examined numerous specimens in search of the fructification, described by Capt. Carmichael, who discovered it after the examination of more than a hundred. The large cell near the middle of the filaments, which I find on my specimens, has not been noticed by other authors who have described or figured the plant, yet it constitutes a very remarkable feature. Possibly it may not be always so obvious. It is hard to say whether it has any connection with the fructification, or what peculiar function it may perform in the economy of the plant, but it appears to have at least an analogical resemblance to what are called *connecting cells* in *Sphærozyga*, the office of of which is equally doubtful. It can have no relation to the spores described by Carmichael, which would appear to be formed from an alteration of the whole filament; not from a solitary joint. Whether it undergoes any change at a later period has not been observed.

Fig. 1. Cruoria pellita, growing on a piece of rock:—*of the natural size*. 2. Portion of a vertical section of the stratum. 3. Tuft of filaments removed and opened. 4. Some of the filaments separated:—*more or less highly magnified.*

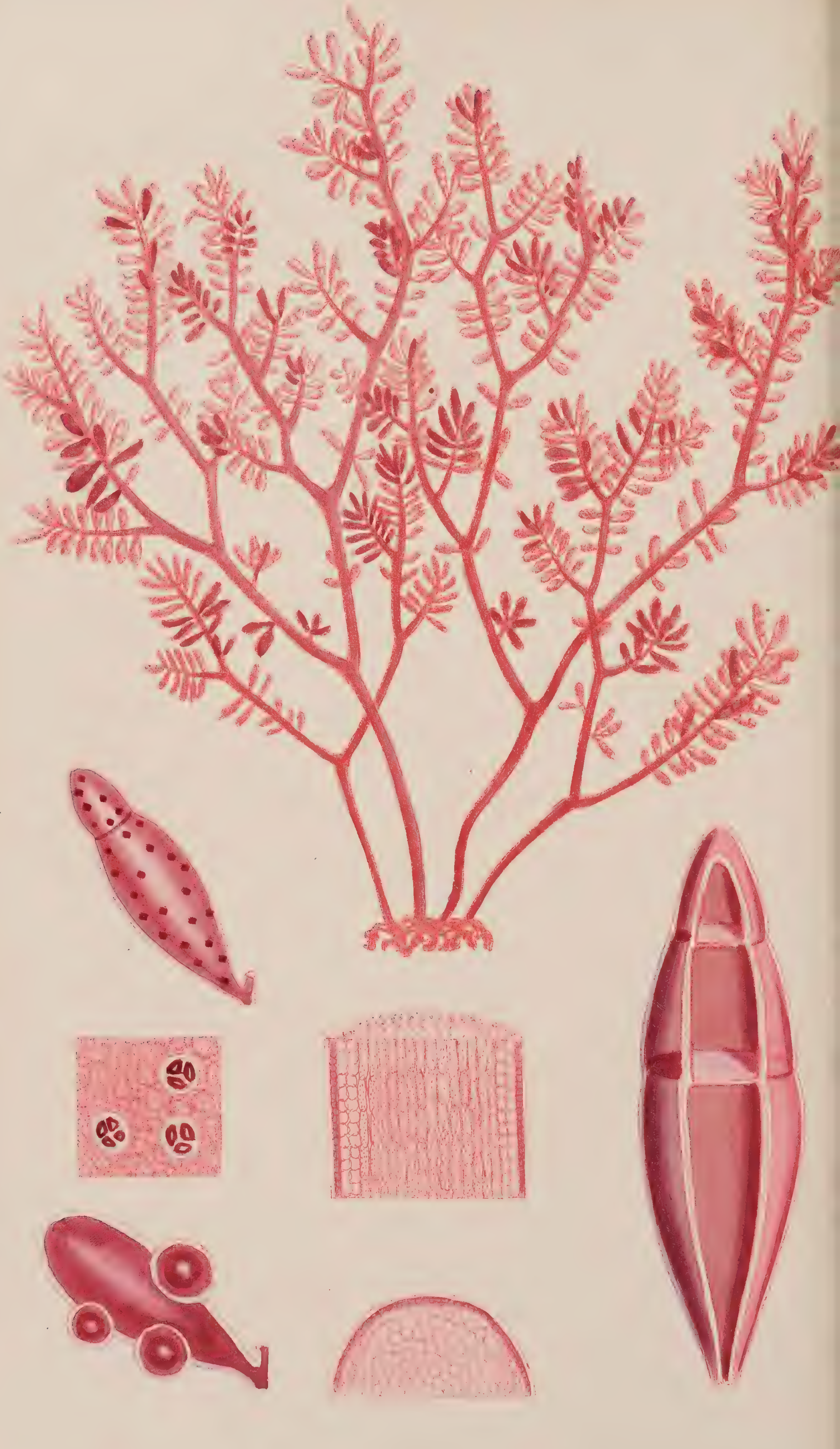


PLATE CXVIII.

CHYLOCLADIA OVALIS, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds on distinct individuals; 1, spherical, ovate or conical *capsules (ceramidia)* containing a tuft of wedge-shaped spores on a central placenta. 2, tripartite tetraspores, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*),—from *χυλὸς*, *juice*, and *κλάδος*, a *branch.*

CHYLOCLADIA *ovalis*; frond cylindrical, solid, irregularly dichotomous, naked below, above beset with simple, elliptical, rarely elongated and jointed, tubular ramuli; capsules spherical, with a wide transparent border.

CHYLOCLADIA ovalis, *Hook. Br. Fl.* vol. ii. p. 297. *Wyatt, Alg. Danm.* no. 114. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 71.

GASTRIDIUM ovale, *Grev. Alg. Brit.* p. 116. t. 14.

GASTROCLONIUM ovale, *Kütz. Phyc. Gen.* p. 441.

LOMENTARIA ovalis, *Endl. 3rd Suppl.* p. 43.

CHONDRIA ovalis, *Ag. Sp. Alg.* vol. i. p. 348. *Ag. Syst.* p. 204. *Spreng. Syst. Veg.* p. 342.

GIGARTINA vermicularis, *Lamour. Ess.* p. 48. t. 4. f. 8, 9, 10.

FUCUS ovalis, *Huds. Fl. Ang.* p. 573. *Sm. E. Bot.* t. 711. *Turn. Syn.* t. 30. *Turn. Hist. Fuc.* t. 81.

FUCUS vermicularis, *Gm. Hist.* p. 162. t. 18. f. 4. *Lightf. Fl. Scot.* p. 958.

FUCUS sedoides, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 117. *Stack. Ner. Brit.* p. 67. t. 12.

HAB. On rocks and stones within tide marks. Annual. Spring and summer. Frequent on the southern shores of England, and on the Irish coasts. Scarborough, *Hudson.* Little Isles of Jura, *Lightfoot.* Papa Westra, *Lieut. Thomas and Dr. Mc'Bain.* Jersey, *Miss Turner.*

GEOGR. DISTR. Atlantic coasts of Europe. Adriatic Sea. North-west coast of America.

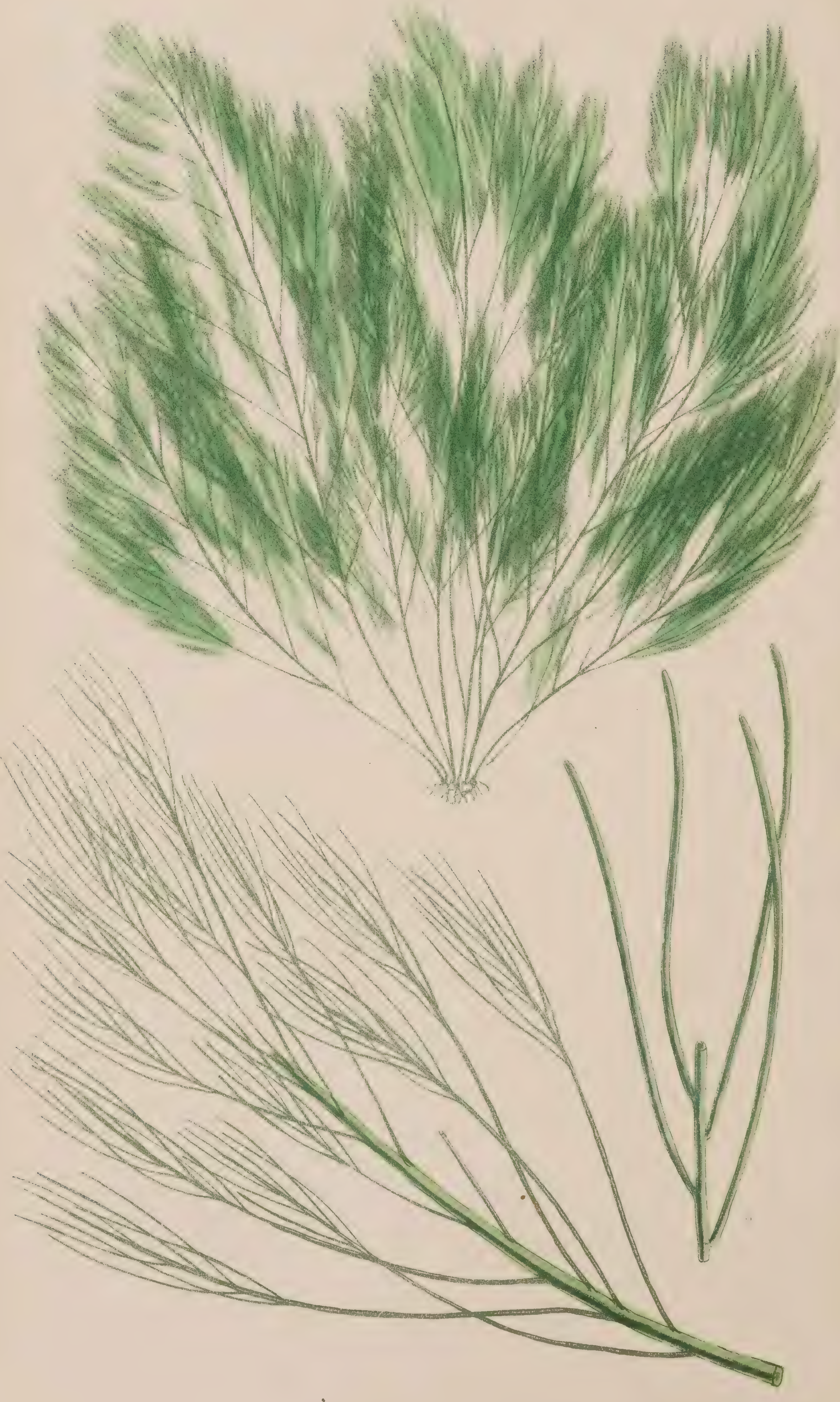
DESCR. *Root* accompanied by grasping branched fibres. *Fronds* tufted, erect, from two to ten inches high, cylindrical, as thick as small twine, of nearly equal diameter throughout, irregularly dichotomous or vaguely divided, the lower half simple and mostly naked, the upper more or less closely forked, all the lesser divisions clothed with imbricated, crowded, obovate or oblong, obtuse, saccate ramuli. In some specimens these ramuli are simple, exactly elliptical, composed of a single joint, and tapering at base into a minute petiole; in others they are linear-oblong, composed of several joints, and throw out at the dissepiments a second set of lesser ramuli. In all the main stem is solid, and densely cellular; the ramuli hollow, filled with a watery fluid. *Ceramidia* spherical, with a wide pellucid border, sessile on the sides of the ramuli. *Tetraspores* tripartite, scattered through the surface cells of the ramuli, on distinct plants. *Substance* cartilaginous in the stem; membranaceous and soft in the ramuli. *Colour*, when in vigour, a deep brownish full-red, afterwards becoming pale, then pink, and finally whitish or greenish in old age. The colour is given out by steeping in fresh water, and the plant adheres closely to paper, when dried with pressure.

* * *

There is some difference in habit betwen this plant and the other members of the genus *Chylocladia*, but so close an affinity in the more important points of its structure, that it appears very undesirable to separate it from them, as has been proposed by Prof. Kützing. Except in having a solid, cellular stem and branches, the hollow and jointed portions being confined to the ramuli, there is nothing to separate it from *C. kaliformis*, the type of the genus. Indeed, as Dr. Greville well remarks, the relationship between *C. ovalis* and *C. kaliformis* is very close, especially in that variety of the former, in which the ramuli are lengthened, and bear several joints, sometimes furnished with the commencement of new whorls. Both are remarkable for the wide, pellucid epidermis, which covers the whole plant, and for a peculiar modification of the *ceramidium*, which in these species resembles, in form, the fruit called *coccidium*, though the arrangement and shape of the spores are essentially the same as in more usual states of the organ.

Chylocladia ovalis, is in greater perfection in the months of April and May, at which season, on the west coast of Ireland, it forms a conspicuous feature in the marine flora, its densely tufted succulent fronds being then of a dark red colour, and produced in the greatest abundance. Two months later, its aspect is completely changed; great multitudes of the fronds have perished, and those that remain are faded in colour, with attenuated and more compound ramuli. By the end of August the plant has almost entirely disappeared.

Fig. 1. CHYLOCLADIA OVALIS:—*of the natural size*. 2. A ramulus with tetraspores. 3. Portion of the surface, with tetraspores imbedded. 4. Ramulus with ceramidia. 5. Longitudinal section of the stem. 6. Transverse semi-section of the same. 7. Longitudinal section of a ramulus, showing the diaphragms:—*all magnified*.



Reeve imp

PLATE CXIX.

BRYOPSIS HYPNOIDES, *Lamour.*

GEN. CHAR. *Frond* membranaceous, filiform, tubular, cylindrical, glistening, branched; the branches imbricated or distichous and pinnated, filled with a fine green, minutely granuliferous fluid. BRYOPSIS (*Lamour.*),—from βρύον, a *moss*, and ὄψις, an *appearance*.

BRYOPSIS *hypnoides*; frond slender, very much branched; branches long, repeatedly compound, densely clothed with capillary, elongate ramuli ramellose towards their tips; ultimate ramelli irregularly inserted, erect.

BRYOPSIS hypnoides, *Lamour. Journ. Bot.* 1809. p. 135. t. 1. f. 2. *Grev. Alg. Brit.* p. 188. *Hook. Br. Fl.* vol. ii. p. 318. *Wyatt, Alg. Danm.* no. 81. *Harv. Man.* p. 146. *Harv. in Mack. Fl. Hib.* part 3. p. 233.

BRYOPSIS Arbuscula, *Ag. Sp. Alg.* vol. i. p. 451. *Ag. Syst.* p. 179. *Kütz. Phyc. Gen.* p. 307.

HAB. On rocks, or parasitical on the smaller *Algæ* in submarine tide-pools, in shaded situations, also on *Laminaria saccharina*, beyond tide marks. Annual. Summer. Not uncommon in many places from Orkney to Cornwall and Jersey. Particularly abundant in parts of the west of Ireland.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

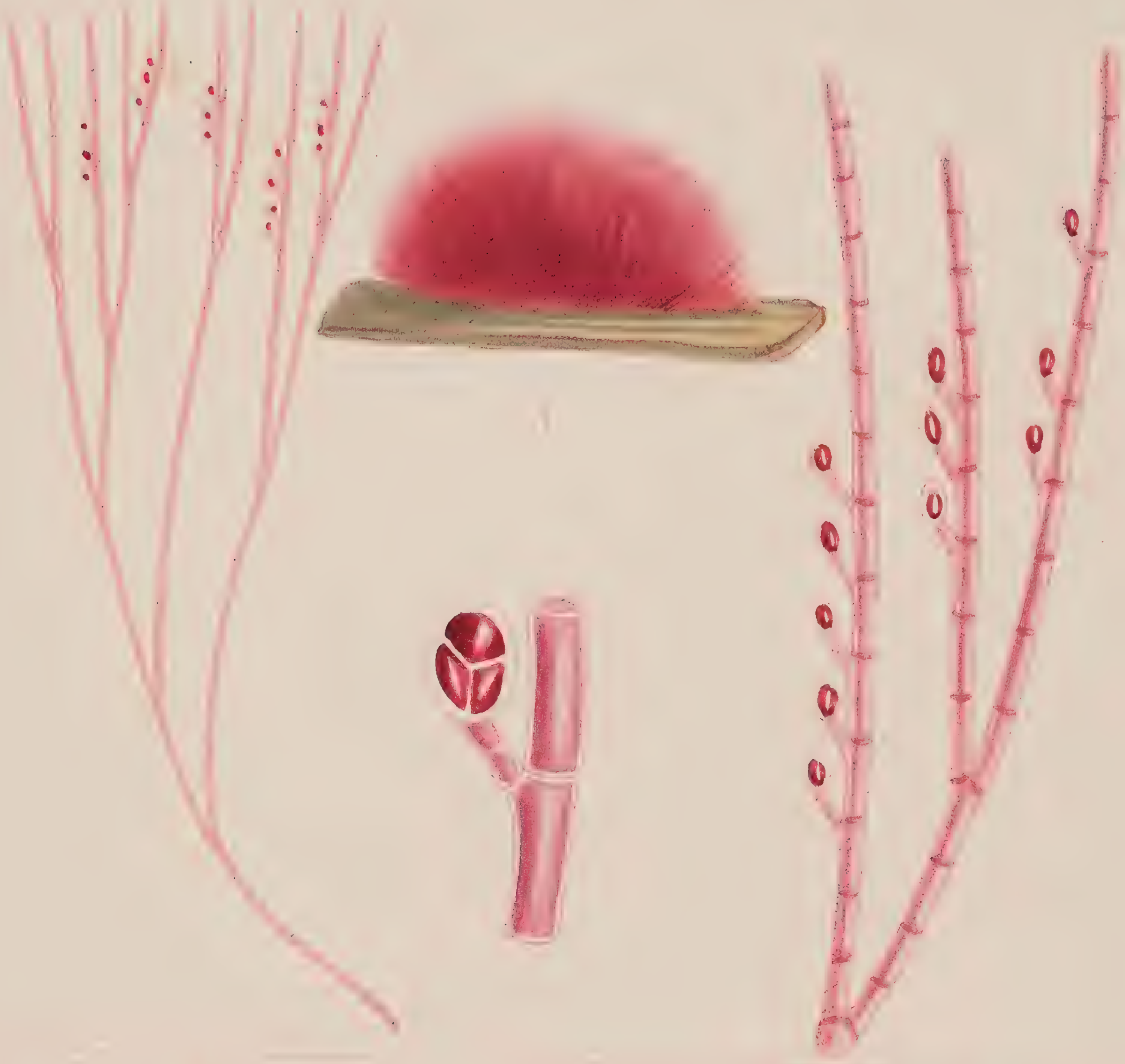
DESCR. *Root* composed of branching fibres matted together. *Fronds* densely tufted, from two to six inches long or more, the principal stems as thick as hogs' bristles, repeatedly and excessively branched, the whole frond having a broadly ovate or conical outline. *Branches* crowded, alternate, long and simple, very erect, naked below, above more or less densely clothed with similar irregularly placed lesser branches of much less diameter. These in their turn produce a third series of capillary ramuli, long simple hair-like and very slender, irregularly feathering the apex of the branch from which they spring. Larger specimens only differ from smaller ones in being more repeatedly divided, the system of branching being the same in all. The substance is very lubricous and flaccid, and soon decomposes in fresh water, the membranous wall of the cells bursting, and discharging a fine granular fluid. *Colour* when growing, a peculiarly deep, rich green, when dry, becoming paler, and more yellow. The plant most closely adheres to paper, and the principal stems and branches retain a gloss, as if they had been varnished, but the ramuli are not glossy.

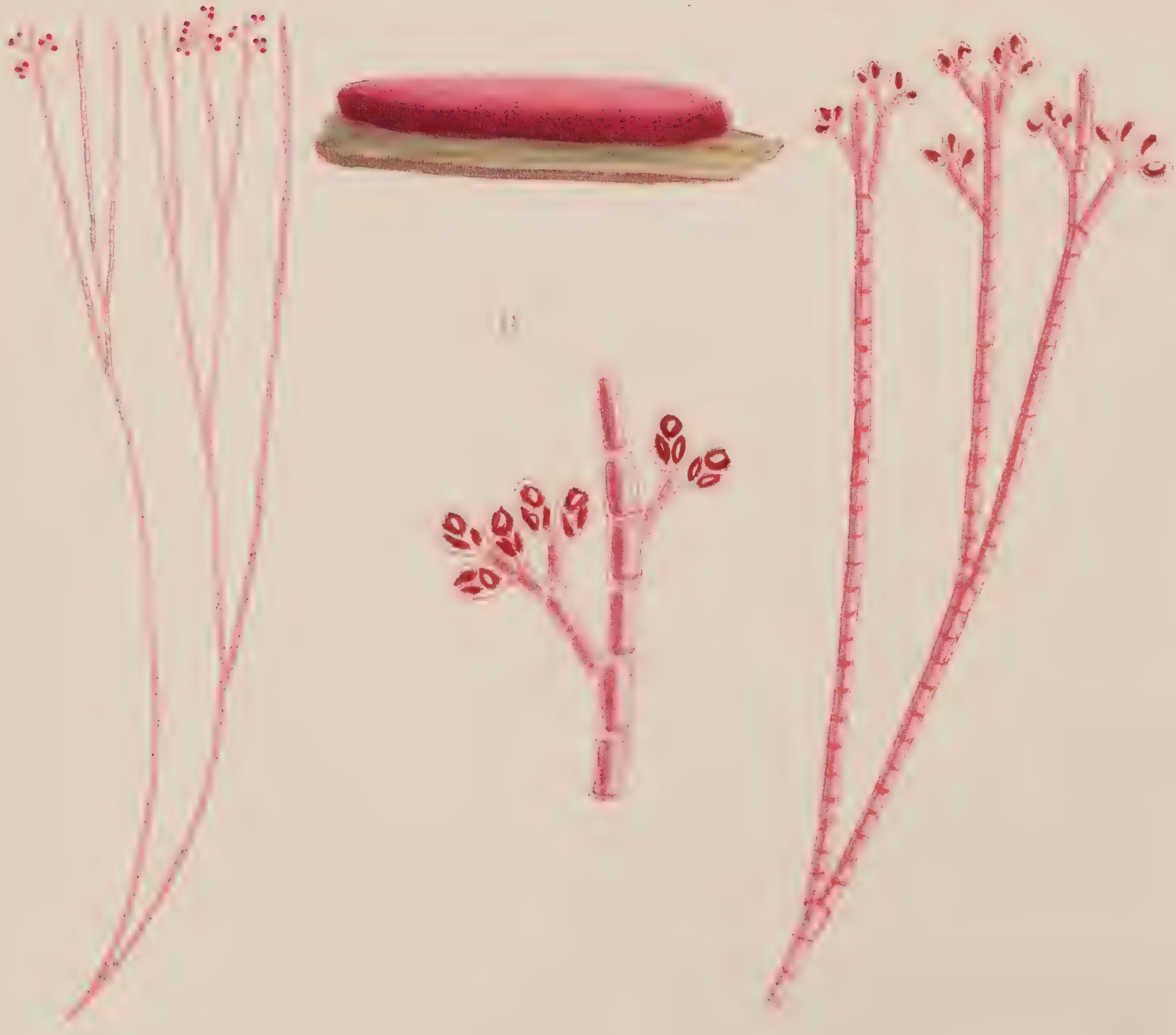
This is a more slender plant than *B. plumosa*, and much more branched; with more abundant, less regular, and longer ramuli, but specimens sometimes occur which show a very close connection between them. On the west of Ireland *B. hypnoides* is the most abundant, and reaches a size much greater than it attains on the English coast. In sheltered bays, where the broad-leaved variety of *Laminaria saccharina* delights to grow, that plant is often seen covered with thick bunches of this *Bryopsis*, of an extraordinary size and luxuriance. These are never exposed at low water, and can only be reached in a boat; but in shady channels and pools between tide marks, even at some distance above the low water limit, specimens of nearly equal size, attached to smaller Algæ, are frequently met with.

Professor J. Agardh in his excellent work on the Algæ of the Mediterranean, considers our *B. hypnoides* to be merely a more advanced state of *B. plumosa*. It is possible that he may be correct in this conclusion, and I confess that I have sometimes been inclined to a similar opinion, though I do not consider that I have before me sufficient data to warrant my adopting this view of the subject, in opposition to the observations of able naturalists, who have decided in the opposite way. The question is, however, open to further enquiry, and I trust, before the conclusion of this work to be able to speak more decidedly. At any rate the present figure will be useful to contrast with that given at Plate III. of the *B. plumosa* of British writers.

Fig. 1. Bryopsis hypnoides:—*the natural size.* 2. Apex of a branch, with its lesser branches. 3. Part of one of the lesser branches, with ramuli:—*both magnified.*

Pl. CX





E.

PLATE CXX. *A.*

CALLITHAMNION FLORIDULUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores,* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles *(favellæ)* seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from κάλλις, *beautiful,* and θαμνίον, a *little shrub.*

CALLITHAMNION *floridulum*; tufts very dense, more or less globose, fastigiate; filaments slender, dichotomous or alternately branched, the branches few, very erect or appressed, long, simple, straight; articulations thrice as long as broad, cylindrical; tetraspores oval, borne on very short, erect pedicels ranged in a secund manner, along the upper branches.

CALLITHAMNION floridulum, *Ag. Sp. Alg.* vol. ii. p. 188. *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. Man.* p. 116. *Wyatt, Alg. Danm.* no. 219. *Kütz. Phyc. Gen.* p. 371.

TRENTEPOHLIA floridula, *Harv. in Mack. Fl. Hib.* part 3. p. 218.

CONFERVA floridula, *Dillw. Conf. Suppl.* t. F.

HAB. On sand-covered rocks, near low-water mark, at all seasons. Perennial? March and April. Abundant on the Galway coast, where it was first observed by *Mr. J. T. Mackay.* Also on the Clare and Kerry coasts, and on the east coast of Ireland. Antrim, *Dr. Scott.* Orkney, *Rev. J. H. Pollexfen.* Land's End, *Mr. Ralfs.*

GEOGR. DISTR. Coast of France.

DESCR. *Filaments* of equal diameter throughout, very slender, silky, closely packed together in dense, more or less fastigiate, roundish tufts, dichotomously or irregularly branched; branches few, long, erect, and very straight, the lower ones longest, the rest gradually shorter. Ramuli few or none, closely pressed to the branches. *Tetraspores* oval, on short pedicels, secundly disposed along the branches. *Joints* fully thrice as long as broad. *Colour* dull pink, becoming more or less purple in drying, the bases frequently fading to a dull green. *Substance* membranaceous imperfectly adhering to paper.

An exceedingly abundant species on the west coast of Ireland, covering a large extent of rock with its hemispherical, densely matted and aggregated cushions. At the close of summer great quantities of these, which are called *figs* by the country people, are washed on shore, and collected as manure, though inferior in strength to many other marine plants.

The fructification was discovered by Mr. Ralfs, in the year 1840.

Fig. *A.* CALLITHAMNION FLORIDULUM:—*of the natural size.* 2. Portion of a filament. 3. Apex of a branch in fruit. 4. Section of a branch, with tetraspores:—*all more or less magnified.*

PLATE CXX. *B.*

CALLITHAMNION ROTHII, *Lyngb.*

CALLITHAMNION *Rothii*; widely spreading, densely tufted; filaments very slender, short, erect, dichotomous or irregularly branched; branches long, straight, appressed; articulations twice as long as broad; tetraspores clustered, borne on short, subterminal, corymbose ramuli.

CALLITHAMNION Rothii, *Lyngb. Hyd. Dan.* p. 129. t. 41. *Ag. Syst. Alg.* vol. ii. p. 185. *Harv. in Hook. Br. Fl.* vol. ii. p. 347. *Harv. Man.* p. 116. *Wyatt, Alg. Danm.* no. 188. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 471.

CERAMIUM Rothii, *Berk. Gl. Br. Alg.* t. 20.

TRENTEPOHLIA Rothii, *Harv. in Mack. Fl. Hib.* part 3. p. 218.

CONFERVA Rothii, *Linn. Syst. Nat.* vol. vi. p. 1806. *Dillw. Conf.* t. 73. *E. Bot.* t. 1702. *Jurg. Alg. Dec.* no. 10.

CONFERVA violacea, *Roth. Cat. Bot.* vol. i. p. 190. t. 4. f. 1. *Fl. Germ.* v. iii. part 1. p. 525.

β. *purpurea*; filaments very minute, forming continuous velvetty patches, slightly branched.

CALLITHAMNION purpureum, *Harv. Man.* p. 116.

TRENTEPOHLIA purpurea, *Ag. Syst.* p. 36. *Harv. in Hook. Br. Fl.* vol. ii. p. 382. *Harv. in Mack. Fl. Hib.* part 3. p. 218.

BYSSUS purpurea, *E. Bot.* t. 192.

CONFERVA purpurea, *Dillw.* t. 43.

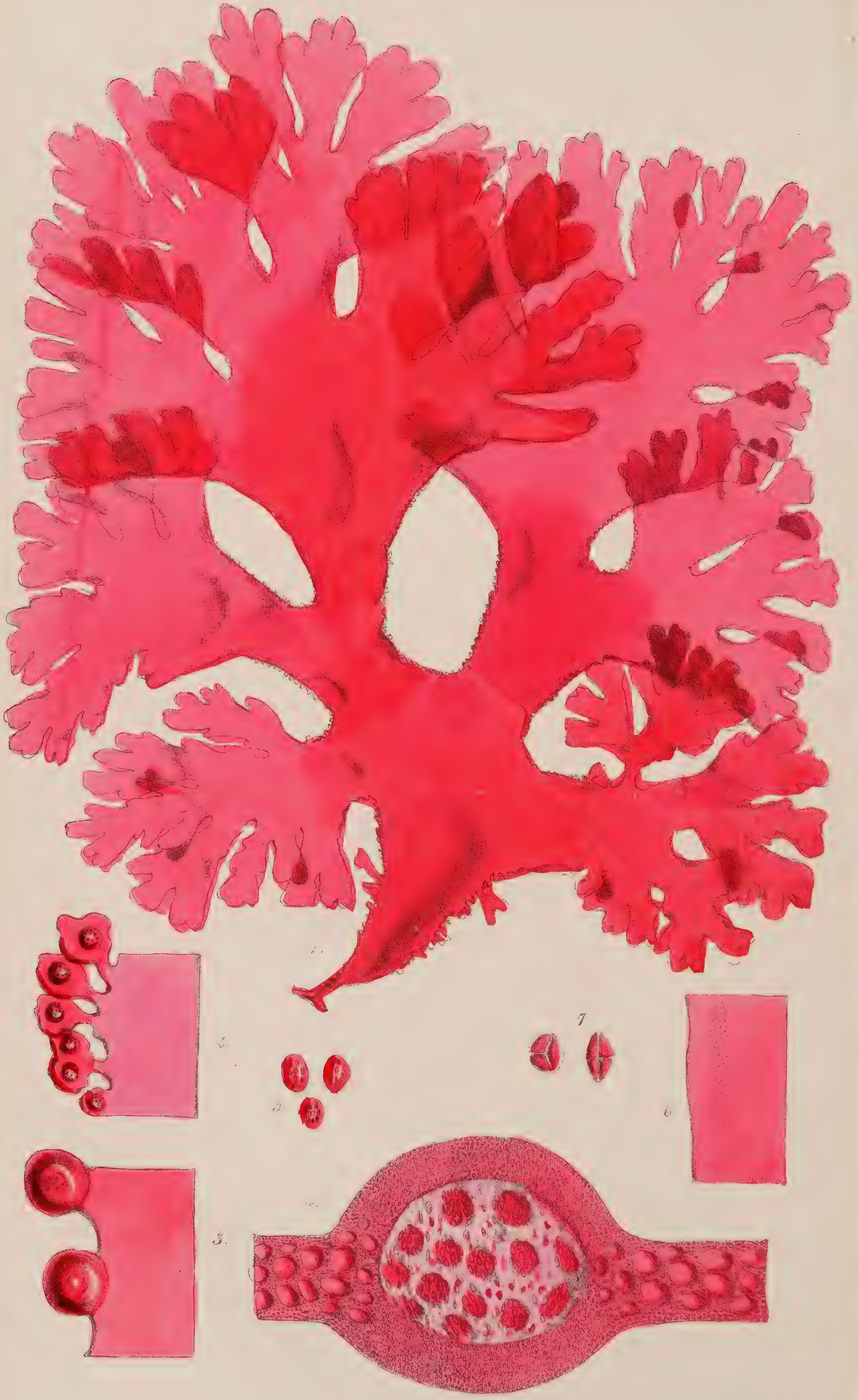
HAB. Spreading over the surface of rocks, about half-tide level. β. on maritime rocks, within the influence of the spray, but beyond the reach of ordinary tides. Perennial. Winter.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea. East coast of North America.

DESCR. *Filaments* from a line to half an inch in height, very slender, densely packed together in extensive velvetty patches, of a deep red or purplish red colour. *Branches* few, simple, and very erect, the lowest longest, generally bare of ramuli. *Tetraspores* two to four, or frequently three together, on short pedicels, growing from the uppermost joints of the branches. *Joints* twice as long as broad. *Substance* membranaceous, more or less perfectly adhering to paper.

A smaller and more slender plant than the preceding, with shorter joints, and well characterized by the difference in fructification. I have ventured, I trust not without sufficient warrant, to unite to *C. Rothii* the old *Conferva* or *Byssus purpurea*, which I have long regarded as a stunted form, whose characters depend on the situation in which it is found growing. In this opinion I am supported by Mr. Ralfs, an accurate and close observer, who has had the best opportunities of investigating the subject.

Fig. *B.* CALLITHAMNION ROTHII:—*of the natural size.* 2. Portion of a filament. 3. Apex of a branch in fruit. 4. Section of a branch with clusters of tetraspores:—*all more or less magnified.*



W.H.H. del. et lith.

Plate CXXI.

RHODYMENIA LACINIATA, *Grev.*

Gen. Char. *Frond* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles (coccidia)*, having a thick, cellular pericarp, and containing a mass of minute spores, on a central placenta; 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. Rhodymenia (*Grev.*),—from *ῥοδος, red,* and ὑμὴν, a *membrane.*

Rhodymenia *laciniata*; frond thickish, sub-cartilaginous, opake, bright red, more or less palmate or flabelliform, cleft into numerous, broad, wedge-shaped segments, which are again divided in a subdichotomous manner; the apices obtuse; the margin, when in fructification curled and fringed with minute ciliæ, in which the tubercles are imbedded.

Rhodymenia laciniata, *Grev. Alg. Brit.* p. 86. *Hook. Br. Fl.* vol. ii. p. 289. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Wyatt, Alg. Danm.* no. 17. *Harv. Man.* p. 60. *Endl. 3rd Suppl.* p. 51.

Delesseria laciniata, *Grev. Fl. Edin.* p. 293. *Hook. in Fl. Lond., New Series,* no. 198.

Delesseria ciliaris, *Lamour. Ess.* p. 37.

Calophyllis laciniata, *Kütz. Phyc. Gen.* p. 401.

Halymenia ciliaris, *Gaill. Dict. Sc. Nat.* v. 53. p. 360.

Sphærococcus laciniatus, *Lyngb. Hyd. Dan.* p. 12. t. 4. *Ag. Sp. Alg.* vol. i. p. 297. *Ag. Syst.* p. 230. *Hook. Fl. Scot.* part 2. p. 103. *Spreng. Syst. Veg.* vol. iv. p. 334.

Fucus laciniatus, *Huds. Fl. Ang.* p. 579. *Lightf. Fl. Scot.* p. 947. *Sm. E. Bot.* t. 1068. *Turn. Syn. Fuc.* p. 161. *Turn. Hist.* t. 69. *Esp. Ic. Fuc.* t. 140.

Fucus crispatus, *Stack. Ner. Brit.* t. 15.

Fucus miniatus, *Fl. Dan.* t. 769.

Fucus crispus, *Esp. Ic. Fuc.* t. 18.

Hab. On rocks and stones in the sea, and on *Laminariæ*; rarely within tide mark. Biennial. January to July. Frequent on the British shores, from Orkney to Cornwall. Common in Ireland. Jersey.

Geogr. Distr. Atlantic shores of Europe from Norway to Spain. Abundant in the Fœroe Islands. Eastern coasts of North America, as far south as Delaware.

Descr. *Root* minute, discoid. *Fronds* tufted, from three to ten inches long, with a short flattish stem, which soon expands into the cuneate base of the frond, cloven into numerous principal segments, all of which are narrow, and wedge-shaped below, gradually wider upwards, and are more or less parted into laciniæ, by vertical clefts. In some varieties the segments are three or four inches broad, and very little divided, except at the superior margin, which presents a rounded outline, and is parted into numerous short pedate lobes, which overlap each other; in others the segments are split nearly to their base into linear-wedge-form ribbons, from a quarter to half an inch in length. The uninjured apices are always obtuse. In fertile specimens the lateral margins of the lobes, especially towards the base, are minutely curled and closely fringed with minute, leafy, subsimple, or multifid processes, in which the tubercles are formed. *Tubercles* variable in size, globose, always formed in the marginal ciliæ, containing several detached groups of spores; spores hyaline, each containing several coloured grains. *Tetraspores* forming cloudy patches, not very obvious, arranged along the margin of the frond, tripartite, or occasionally cruciate. *Frond* composed of very minute cells, arranged in a somewhat fibrous manner, traversed by numerous empty spaces or *lacunæ*. *Substance* thickish, somewhat cartilaginous. *Colour* a beautiful, clear, bright red, varying to crimson or blood colour, and well preserved in drying.

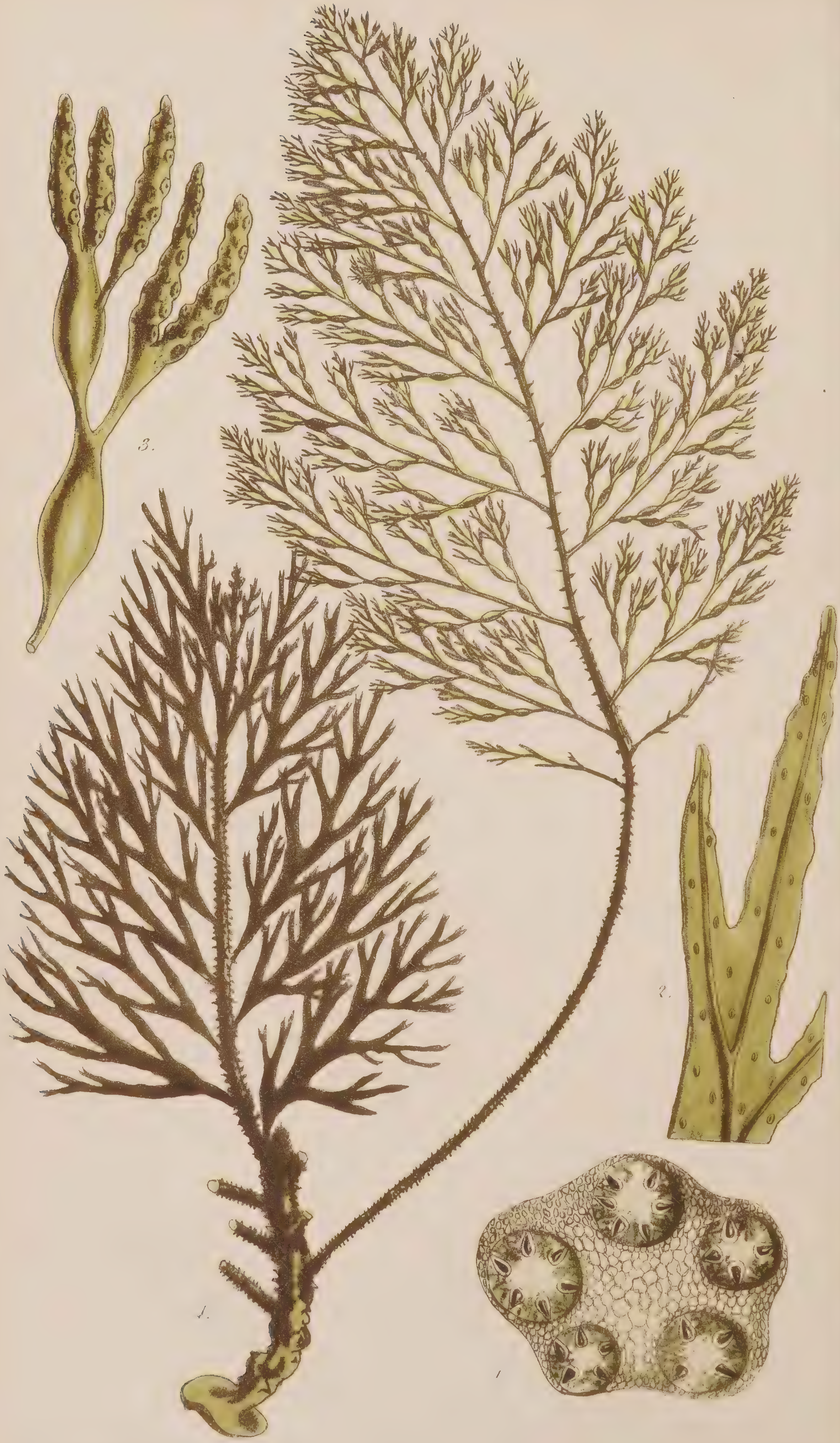
* * *

This species is subject to very considerable variation in form, in size, and in the relative proportion of its different parts, and yet there is so much that is common to every variety, that it is rarely mistaken for anything else, although in the earlier days of marine botany, its synonymy was very much confused. The modern division into genera has certainly facilitated in this instance, the recognition of species, and there is now no need to contrast the characters of this Alga with those of *Nitophyllum laceratum*, as was necessary at the time when Mr. Turner commenced his labours. The difference in the structure of the frond and in the fructification, are so marked and obvious that no commonly attentive person can now confound these two plants.

The structure of the frond in *Rhodymenia laciniata* is considerably different from that of the typical species, and at a future time, it may become the type, as already proposed by Kützing, of a new group, to which, probably, several exotic species may belong. The large empty spaces, or lacunæ, with which the substance is permeated, which do not appear to be enlarged cells, but rather cavities, are not found in true *Rhodymeniæ*; and it is these, seen through the surface cellules, which give the appearance of areolation, noticed by Mr. Turner, when the plant is examined with a pocket lens, and which is lost if the frond be subjected to a higher magnifier.

Fig. Rhodymenia laciniata:—*of the natural size.* 2. Tubercles of the ordinary kind. 3. Tubercles of larger size, occurring on plants which are imperfectly ciliate. 4. Section of a tubercle and of the frond. 5. *Spores.* 6. Part of a sorus of *tetraspores.* 7. *Tetraspores:—all more or less magnified.*

Plate CXXII



W H H del et lith.

PLATE CXXII.

CYSTOSEIRA FŒNICULACEA, *Grev.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from κύστις, a *bladder* and σειρὰ, a *chain*; because the air-vessels are often arranged in strings.

CYSTOSEIRA *fœniculacea*; stem compressed; branches long, slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, solitary or two together, elliptical oblong, placed near the tips of the branches; receptacles minute, smooth, linear-lanceolate.

CYSTOSEIRA fœniculacea, *Grev. Alg. Brit.* p. 6. *Hook. Br. Fl.* vol. ii. p. 265. *Wyatt, Alg. Danm.* no. 51. *Harv. Man.* p. 18.

CYSTOSEIRA discors, *Ag. Sp. Alg.* vol. i. p. 62. *Ag. Syst.* p. 284. *Spreng. Syst. Veg.* vol. iv. p. 317. *J. Ag. Alg. Medit.* p. 51. *Endl. 3rd Suppl.* p. 30. *Menegh. Alg. Ital. and Dalm.* vol. i. p. 83. *Mont. Fl. Alger.* p. 17. *Kütz. Phyc. Gen.* p. 358.

CYSTOSEIRA abrotanifolia, *Ag. Sp. Alg.* vol. i. p. 63. *Ag. Syst.* p. 284. *Spreng. Syst. Veg.* vol. iv. p. 317. *J. Ag. Alg. Medit.* p. 52. *Endl. 3rd Suppl.* p. 30. *Menegh. Alg. Ital. and Dalm.* vol. i. p. 92. *Mont. Fl. Alger.* p. 19. *Kütz. Phyc. Gen.* p. 357.

FUCUS fœniculaceus, *Linn. Sp. Pl.* p. 1629. *Turn. Hist.* p. 252.

FUCUS discors, *Linn. Syst. Nat.* p. 717. *Turn. Syn.* p. 70. *Esper, Ic.* t. 26. *Stack. Ner. Brit.* t. 17. *E. Bot.* t. 2131. *Lamour. Ess.* p. 17.

FUCUS abrotanifolius, *Linn. Sp. Pl.* p. 1629. *Huds. Fl. Angl.* p. 575. *Stack. Ner. Brit.* p. 86. t. 14. *Turn. Syn.* p. 66. *E. Bot.* t. 2130. *Lamour. Ess.* p. 18.

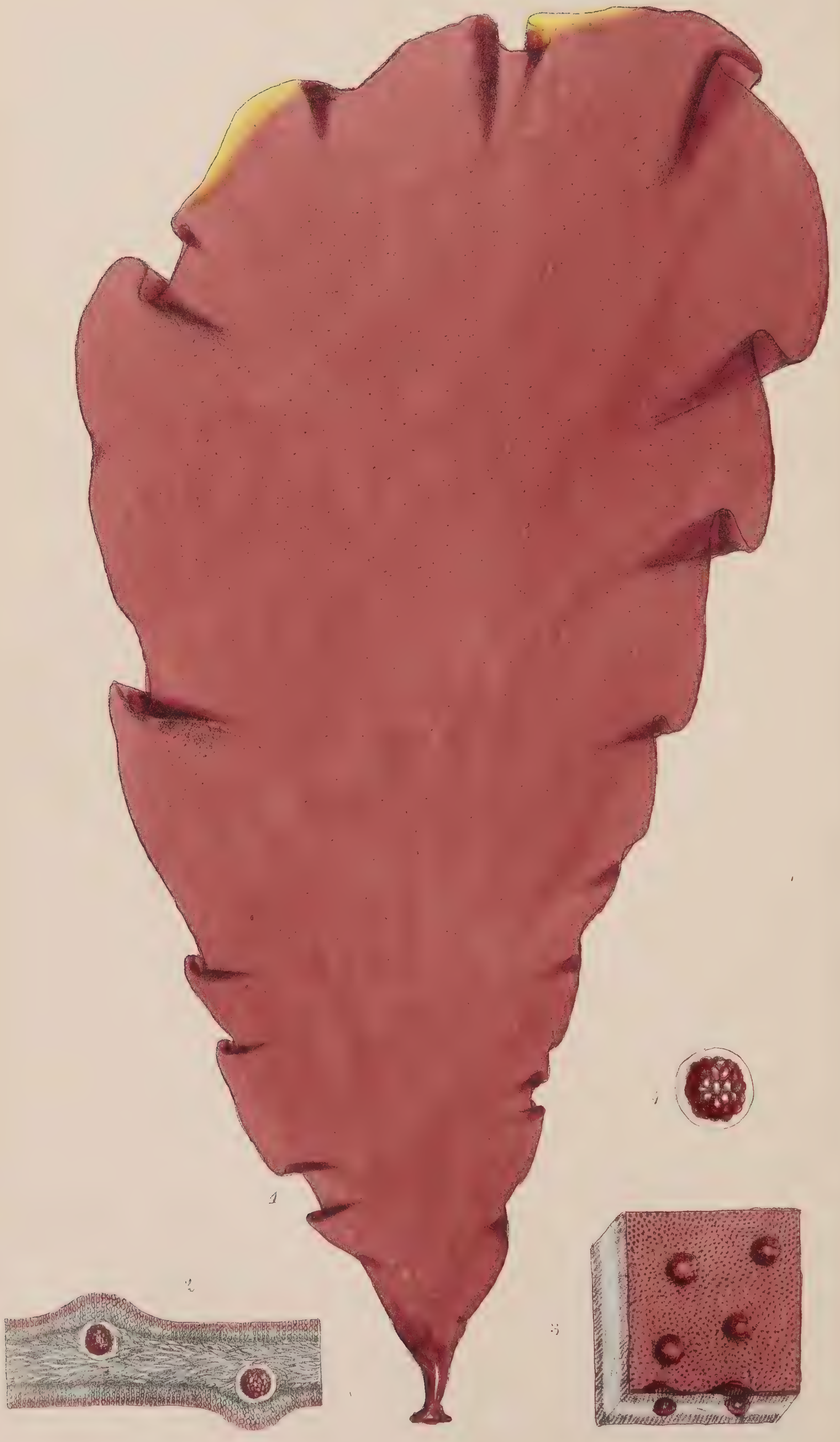
HAB. Growing on rocks, in tide pools, near low-water mark. Perennial. Summer. Southern shores of England, in several places. Sussex, *Hudson*. Sidmouth and Torquay, *Mrs. Griffiths*. Weymouth and Isle of Wight, *Stackhouse*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of England, from the south of England to Spain. Mediterranean Sea.

DESCR. *Root* a thick, hard, conical disc. *Fronds* one to two feet long, much branched. *Stem* four to six inches long, as thick as a goose quill, rough in the upper part, with spine-like prominences. *Branches* numerous, lateral, alternate, one to two feet long, filiform, rough with spinous processes, especially below; the older ones naked at base, pinnated above, with an ovate outline. *Pinnæ* twice or thrice divided in a mixed alternate and dichotomous manner, slender, containing small, elliptical air-vessels below their forkings. The branches of young plants, and occasionally of the younger parts of the stem in old plants, are flat and leaf-like, bi-pinnate; the pinnules furnished with a midrib, and muciferous pores, with a crenate or subdentate margin, and varying from a line to two or three lines in breadth. *Receptacles* one or two lines long, simple or forked, smooth, subtorulose, lanceolate, terminating most of the upper pinnæ of fertile specimens, and frequently subtended by vesicles. *Colour* dark in the stem; a pale olive in the branches. *Substance* between coriaceous and cartilaginous, brittle when dry.

I follow Turner, and all succeeding British writers, in uniting, under the common name *fœniculacea*, the *Fucus discors* and *F. abrotanifolius* of Linnæus, which continental authorities, without exception, retain in the rank of species. So far as a judgment may be correctly formed from dried specimens, I fully agree with Mr. Turner, that "each shape passes into the other by gradations so imperceptible that no line can be drawn between them"; and this excellent author further remarks, that in separating it into distinct varieties, he has rather yielded to the feeling of weakness than followed the dictates of his judgment; fearing that if he did otherwise, he might be accused of presumption, or even of a worse motive, in refusing to find characters sufficient even for varieties, where other botanists have had no hesitation in laying down such as constitute species. I have not myself had much opportunity of examining the living plant, but I place implicit reliance on the accuracy of the observations made during many years familiarity with this species, by my often mentioned friend Mrs. Griffiths, who states that such specimens as grow in deep water, where they are seldom or never exposed by the tides, constitute the *F. discors* of authors, especially if collected in summer, at which season they are extremely luxuriant, with broad leaves and large air-bladders; and that fronds which are developed in shallow tide-pools, or collected late in autumn or winter, being more branched, and having narrower leaves, make the *F. abrotanifolius*. On the depth of water, or difference of season, therefore, depend all the characters on which it has been attempted to erect two species.

CYSTOSEIRA FŒNICULACEA:—*of the natural size*. 2. Portion of a leafy branchlet. 3. Air-vessels and receptacles. 4. Transverse section of a receptacle:—*more or less magnified*.



W.H.H. del et lith.

Reeve imp.

PLATE CXXIII.

KALLYMENIA DUBYI, *Harv.*

GEN. CHAR. *Frond* blood-red, ribless, expanded, carnoso-membranaceous, formed internally of three strata; the *inner*, of interlacing filaments; the *medial*, of large, roundish cells; the *outer*, of minute, vertical filaments. *Fructification* two-fold, on distinct plants; 1, spherical masses of spores *(favellidia)*, semi-immersed in the frond; 2, triangularly divided, scattered tetraspores. KALLYMENIA (*J. Ag.*),—from καλλις, *beautiful*, and ὑμην, a *membrane.*

KALLYMENIA *Dubyi*; stem compressed, gradually expanding into an obovate, simple, dull-red frond, wedge-shaped at base; favellidia very minute, densely scattered over the surface.

HALYMENIA Dubyi, *Chauv. Bot. Gall.* p. 944.

HALYMENIA laminarioides, *Bory, sec. Lenorm.*

NEMOSTOMA Dubyi, *J. Ag. Alg. Medit. in not.* p. 96.

IRIDÆA Dubyi, *Lenorm. in Herb.*

DELESSERIA Ferrarii, *Bonnem. et Lamour. sec. Lenorm.*

HAB. On rocks and stones, within tide-marks, in land-locked bays. Annual. Spring and early summer. Falmouth Harbour, *Miss Warren.* Plymouth, *Rev. W. S. Hore*, and *Mr. J. W. Rohloff.* (Carnlough Bay, *Miss Davison.* [1833.] Belfast Bay, in ten fathoms water, *Mr. W. Thompson.*)

GEOGR. DISTR. Atlantic shores of France and Spain.

DESCR. *Root* a small, conical disc. *Stem* a line or two in length, compressed, soon expanding into the cuneate base of the frond. *Fronds* six to twelve inches long, three to five inches wide, carnoso-membranaceous, oblong, or more or less obovate, somewhat undulate at the margin, simple, obtuse, tapering at the base; rarely cloven, and never naturally so; in age becoming thicker and more cartilaginous. *Fructification*; very minute, dot-like *favellidia*, immersed in the substance of the leaf, somewhat prominent on one surface, densely scattered over the whole frond, spherical, containing a dense mass of angular spores, surrounded by a hyaline pericarp. *Colour* a dull, deep red, becoming paler, and, finally yellowish in age.

* * *

In the remarks under *Kal. reniformis*, already figured at Plate XIII., I have noticed a plant as having been found at Falmouth by Miss Warren, which I suggested might belong to a different, but closely allied, species. The figure now given is taken from one of Miss Warren's specimens, and it appears to be identical with what I have received from M. Lenormand as the *Halymenia Dubyi* of Chauvin. It will be seen that the frond is considerably different in form from the typical specimens of *K. reniformis,* the outline much more approaching that of *Iridæa edulis.* Some of Miss Warren's specimens are even larger than here represented; but the majority are of less size. All have very much the same general outline: those gathered at a later period of the year are of a much firmer consistence and denser substance than the rest. From the Rev. Mr. Hore I possess specimens gathered at Plymouth, quite similar to the Falmouth ones, except that they are split at the apex; a peculiarity which originated, Mr. Hore informs me, after they had been gathered. I am not quite so certain that the Irish habitats given, on Mr. Thompson's authority, belong to this species, and not to a variety of *K. reniformis,* the specimens which I have seen not being in a sufficiently perfect state to remove all ambiguity. Should these stations be established, the merit of having added a new plant to our flora must attach to Miss Davison; whose specimens are dated so long back as 1833.

Besides mere form, which is not absolutely to be depended on, this plant differs from *K. reniformis* in the duller colour, in its globules of spores being of a much smaller size, and somewhat in the structure of the frond. It arrives at maturity, too, at a much earlier season, being in greatest perfection in March and April, and becoming much faded and passing into decay in August; just at the period when the full-grown and strongly coloured fronds of *Kal. reniformis* begin to come on shore. Whether or not that species be perennial, as seems probable, from the proliferous individuals which are frequently found, the present is certainly an annual, arriving at maturity and passing away within six months.

Fig. 1. KALLYMENIA DUBYI:—*of the natural size.* 2. Transverse section of the frond, and of the favellidia. 3. Fragment, to show the surface cellules. 4. A favellidium:—*magnified.*

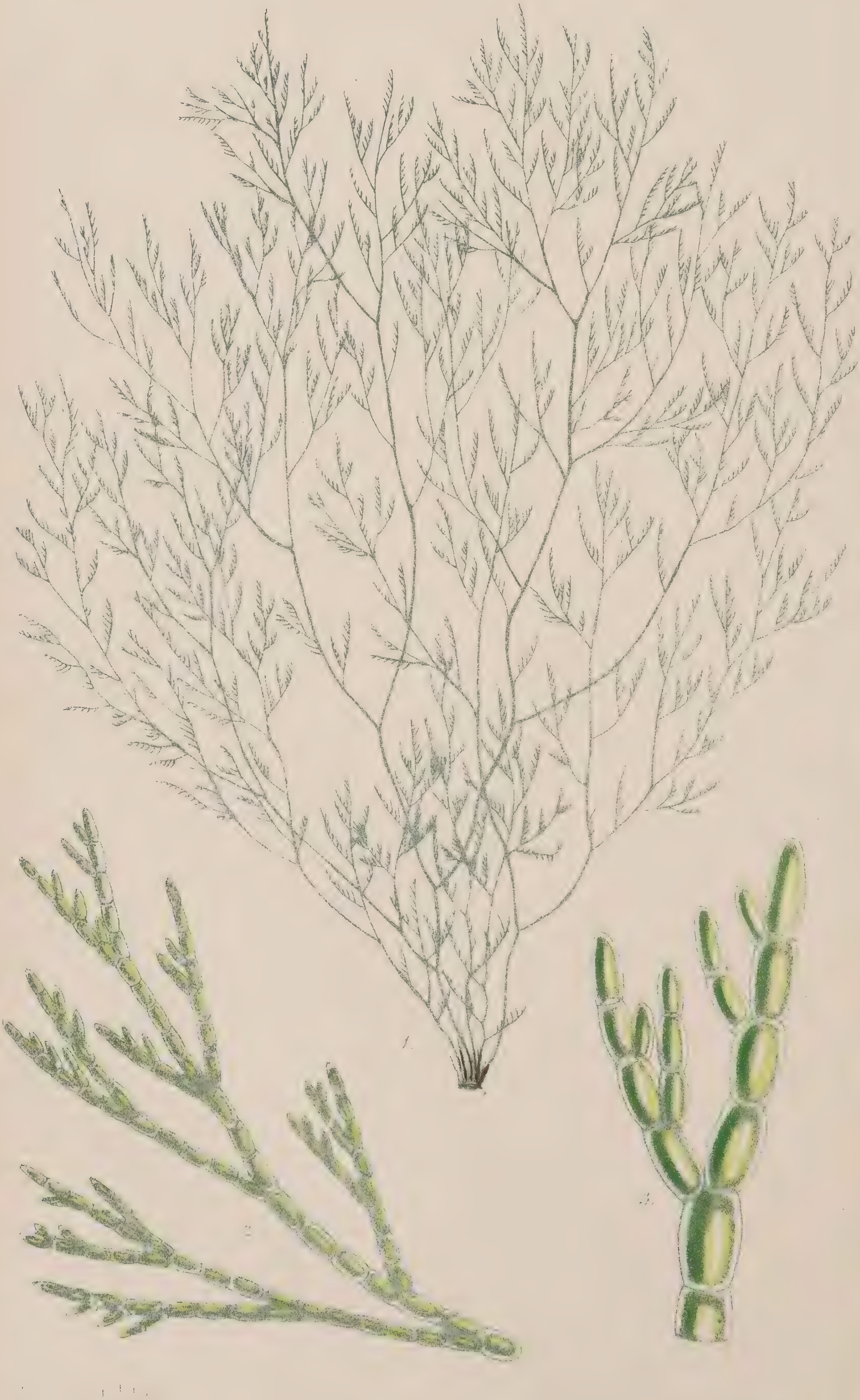

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PLATE CXXIV.

CLADOPHORA HUTCHINSIÆ, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλαδος, a *branch*, and φορεω, to *bear*.

CLADOPHORA *Hutchinsiæ*; filaments setaceous, of equal diameter throughout, rigid, crisp, glaucous-green, flexuous, tufted, bristling; ramuli erecto-patent, simple or furnished along the inner face with short processes of one or two articulations; apices very obtuse; articulations twice or thrice as long as broad, the joints contracted.

CONFERVA Hutchinsiæ, *Dillw. Conf.* t. 109. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 135. *Wyatt, Alg. Danm.* no. 226.

HAB. On the rocky bottoms of clear tide-pools, near low-water mark. Annual. Summer. Rather rare. Bantry Bay, *Miss Hutchins.* Larne, *Dr. Drummond.* Tor Abbey, *Mrs. Griffiths.* Belfast Bay, *Mr. W. Thompson.* Ardrossan, *Major Martin.* Saltcoats, *Rev. D. Landsborough.* Salcombe, *Mr. Ralfs.*

GEOGR. DISTR. Atlantic shores of Europe?

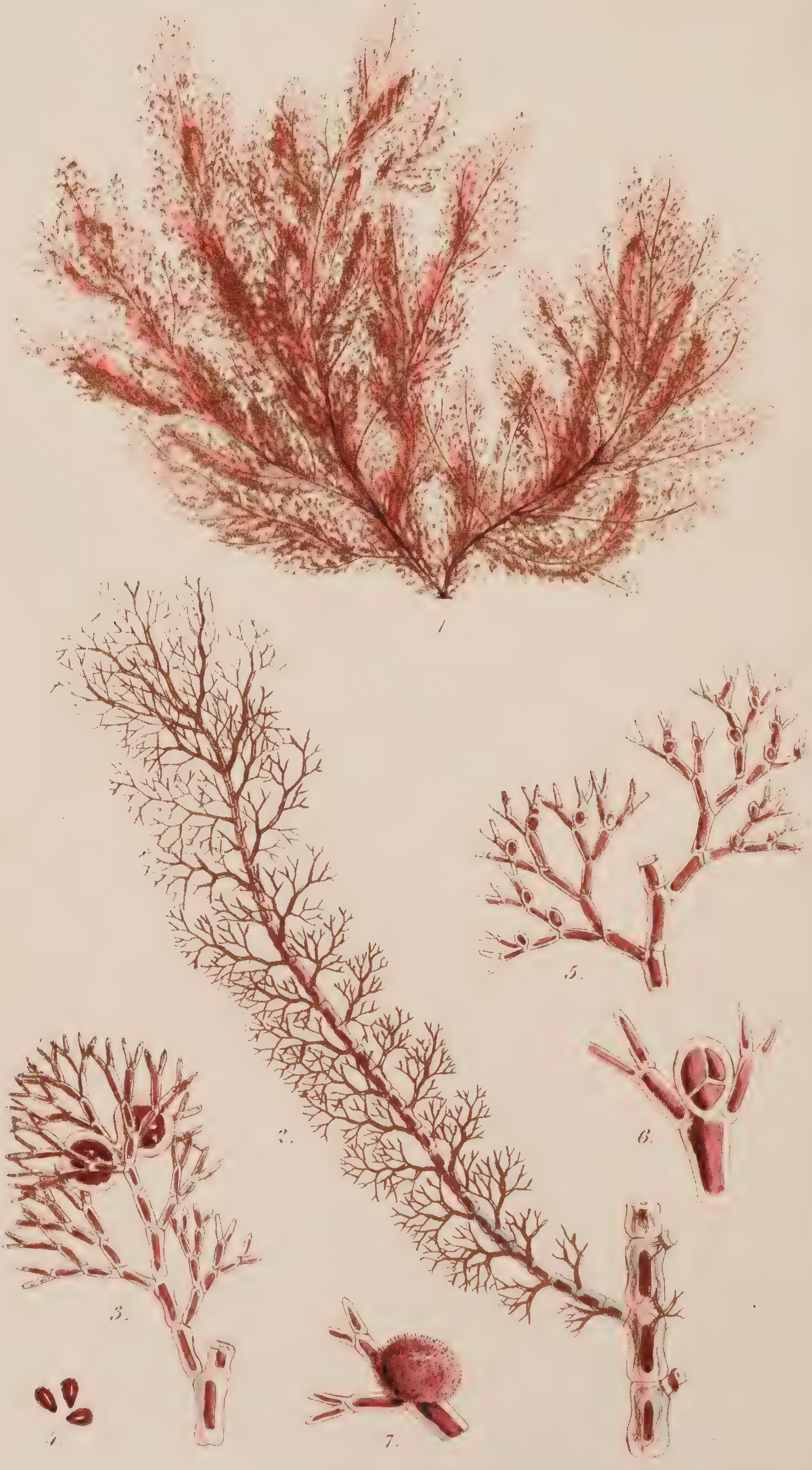
DESCR. *Filaments* as thick as horse-hair, or sometimes thicker, from six to twelve inches or more, long, densely tufted, but not massed together, rigid, the branches standing out from one another, and bristling when removed from the water, repeatedly but very irregularly divided. In some specimens the filaments are very much branched; in others subsimple or a few times forked. *Branches* long, flexuous, generally bending in graceful curves, sometimes zigzag, more or less compound, furnished with short, alternate or secund, scattered, erecto-patent ramuli, which are often simple, and often furnished on their inner faces with several secund processes, the whole ramulus resembling a little comb. *Articulations* tolerably uniform in all parts of the plant, about twice as long as broad, occasionally somewhat longer, containing a bag of dense, granular, deep green endochrome. *Joints* slightly contracted. *Apices* very obtuse, and not in the least attenuated. *Colour* when growing, a beautiful glaucous green, appearing, when viewed in the water, almost white; when dry, varying according to age, from a yellow-green to a deep grass-green.

A very beautiful and strong-growing species, discovered about the year 1808, by the late Miss Hutchins, of Ballylicky, near Bantry, whose explorations of her neighbourhood were as unremitted as they were successful; and whose name is deservedly held in grateful remembrance by botanists, in all parts of the world. To her the botany of Ireland is under many obligations; particularly the Cryptogamic branch, in which field, till her time but little explored, she was particularly fortunate in detecting new and beautiful objects, several of which remain among the rarest species to the present day. Mr. R. Brown, "the Prince of Botanists," has dedicated the genus Hutchinsia, consisting of several pretty alpine species of Cruciferous plants, to her memory; and Agardh, the great Swedish Alogologist, had, about the same time, selected the beautiful and extensive genus now called *Polysiphonia*, for a like purpose. Most lovers of marine botany will regret that the priority in point of publication attaches to the Cruciferous genus; and that therefore the name of Miss Hutchins can only be associated in a minor degree with the tribe of plants to which she was especially attached. But Miss Hutchins was not a mere Algologist: she cultivated with equal ardour every department of Natural History, and to her may most justly be applied the lines quoted by Mr. Turner when concluding a grateful tribute to her memory, in the last page of his 'Historia Fucorum'.—

> "In every season of the beauteous year
> Her eye was open, and with studious love,
> Read the Divine Creator in his works.
> Chiefly in thee, sweet Spring, when every nook
> Some latent beauty to her wakeful search
> Presented, some sweet flower, some virtual plant.
> In every native of the hill and vale
> She found attraction; and where beauty failed,
> Applauded odour or commended use."

Cladophora Hutchinsiæ is very closely allied to *C. diffusa*; but the filaments are of greater diameter, the ramuli more abundant and shorter, and the joints shorter and generally contracted at the dissepiments.

Fig. 1. Cladophora Hutchinsiæ:—*of the natural size*. 2. Part of a filament. 3. Small portion of the same:—*both magnified*.



W. H. Harvey del. et lith.

Reeve, imp.

PLATE CXXV.

CALLITHAMNION SPONGIOSUM, *Harv.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles *(favellæ)* seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from κάλλις, *beautiful*, and θαμνίον, a *little shrub.*

CALLITHAMNION *spongiosum*; stems robust, cartilaginous, more or less opake and veiny, branched in every direction; branches thickly set with dense, quadrifarious, repeatedly dichotomous, round-topped branchlets; axils patent; apices short, bifid; articulations of the branches swollen at the joints, twice or thrice as long as broad.

CALLITHAMNION spongiosum, *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 113. *Wyatt, Alg. Danm.* no. 93. *Crouan, in Dezm. Pl.*

HAB. On perpendicular submarine rocks, near low-water mark, and parasitically on other Algæ. Annual. Summer. Dunleary (1802), *Mr. Templeton.* Larne, *Dr. Drummond.* Torquay, *Mrs. Griffiths.* Kingstown Harbour and Killiney, *W.H.H.* Salcombe, *Mrs. Wyatt.* Plymouth, *Rev. W. S. Hore and Mr. Rohloff.* Land's End and Ilfracombe, *Mr. Ralfs.* Jersey, *Miss White.* Saltcoats, and Largo, Fife, *Rev. D. Landsborough.* Kilbride, *Major Martin.* Falmouth, *Miss Warren.*

GEOGR. DISTR. British Islands, and Atlantic shores of France.

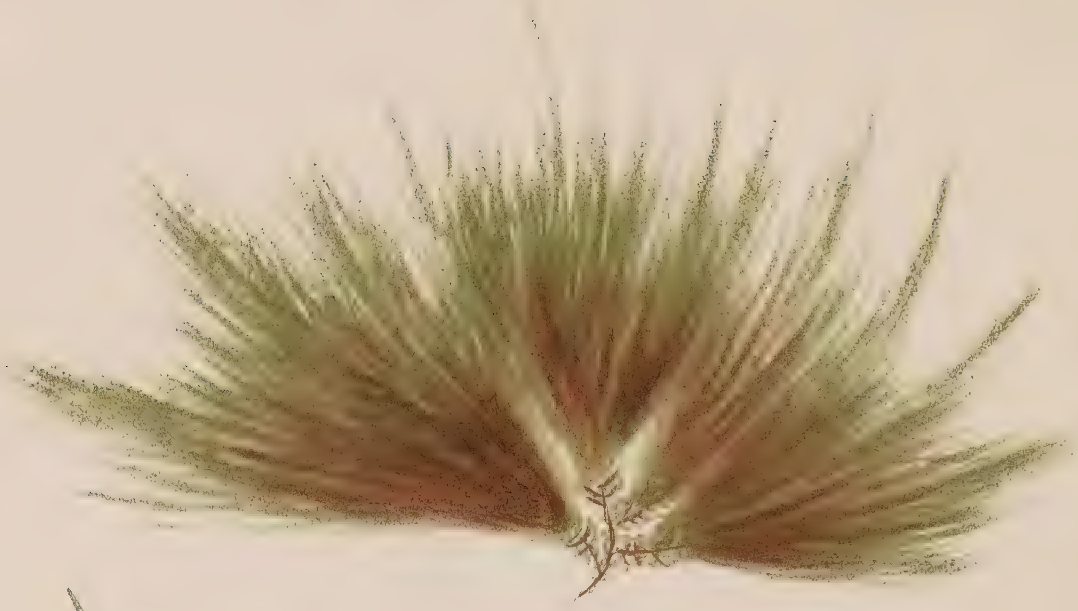
DESCR. *Fronds* tufted, two to four inches high, with a conical outline, flaccid, soft, holding water like a sponge. *Stems* thicker than bristle, more or less opake and veiny, branched in every direction, and thickly clothed with short ramuli. *Branches* long, sparingly divided, but very densely clothed with quadrifarious secondary branches, the lowermost of which are longest, the rest gradually shorter upwards; these are, in luxuriant specimens, furnished with a second or third series, the penultimate ones being linear-obovate and round-topped in outline, and densely set throughout their length with short, dichotomous ramuli. *Ramuli* repeatedly dichotomous, with patent axils, forking at every joint; apices short, bifid and very obtuse. *Tetraspores* elliptical, solitary, sessile in the forkings of the ramuli, triparted. *Favellæ* large, and generally bi-lobed, the lobes roundish, placed at the summits of abbreviated branches, frequently surrounded by two or three dichotomous ramuli. *Substance* flaccid, membranaceous, but not gelatinous, destitute of gloss when dry. *Colour* a dull purplish- or brownish-red. *Articulations* of the main stems more or less filled with longitudinal veins; those of the branches and branchlets with a very narrow coloured tube, surrounded by a broad transparent border; the joints more or less swollen; all pretty uniformly twice or thrice as long as broad, those of the stem occasionally somewhat longer. In some specimens the place of tetraspores is occupied by roundish bodies (fig. 7.), composed of exceedingly minute, dichotomous filaments, radiating from a central point: these may either be regarded as viviparous tetraspores, or, possibly, as antheridia.

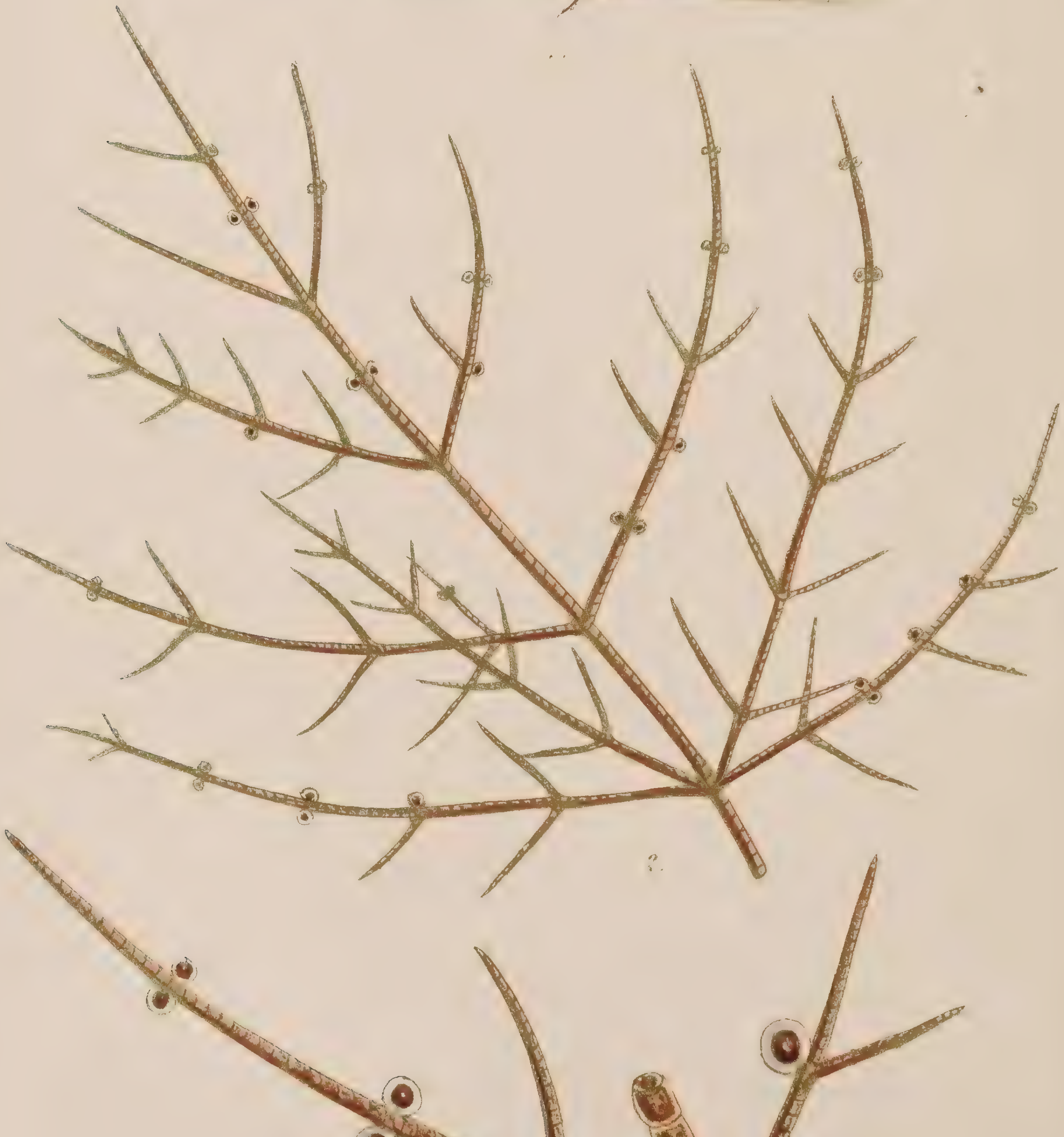
This species was originally detected in the year 1802, by the late Mr. Templeton, of Belfast, at the station where, thirty years later, I gathered it, without being at the time aware of the previous discovery. Of recent years it has been found on so many different parts of the coast, that it must be regarded as one of our commoner species; but it does not appear to be generally diffused, not having yet been noticed in the west of Ireland, although frequent on some parts of the eastern shores. The finest specimens I have seen are those collected by Messrs. Hore and Rohloff, in Plymouth Sound; a locality which seems peculiarly favourable to the growth of *Callithamnion*.

Callithamnion spongiosum has much the external appearance of *C. Arbuscula*; but its microscopic characters are so different, that they belong to separate sections of the genus. It is much more nearly allied to *C. corymbosum*, or the exotic *C. granulatum*; a south of Europe species, which has so much in common with it, that I shall not be surprised if future observations lead to their being united. My specimens of that plant are, however, not sufficiently perfect to enable me at present to decide the question. From *C. corymbosum*, the duller colour, shorter joints, more robust and opake stems, and dense, spongy habit, sufficiently distinguish it. It is curious that it appears to occupy the place of *C. Arbuscula*, on shores where the latter is not found, these plants never growing together, though both affect similar situations on different shores.

Fig. 1. CALLITHAMNION SPONGIOSUM: a tuft:—*of the natural size.* 2. A secondary or tertiary branch. 3. A branchlet truncated and bearing favellæ. 4. Spores. 5. A ramulus, with tetraspores. 6. A tetraspore, *in situ*:—*more highly magnified.* 7. Viviparous tetraspores?

Plate CXXVI

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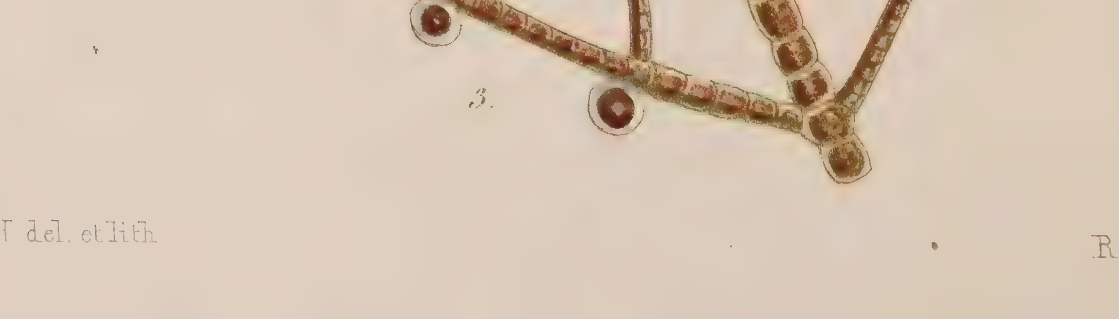
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W. H. H. del. et lith.

Reeve imp

PLATE CXXVI.

ECTOCARPUS SPHÆROPHORUS, *Carm.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from εκτος, *external,* and καρπος, *fruit.*

ECTOCARPUS *sphærophorus*; filaments slender, short, densely tufted, much branched; upper branches patent, opposite or in fours, bearing patent, opposite ramuli; spores globose, sessile, either opposite to each other, or to a branchlet.

ECTOCARPUS sphærophorus, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Harv. in Mack. Fl. Hib.* part 3. p. 182. *Harv. Man.* p. 42. *Wyatt, Alg. Danm.* no. 173.

ECTOCARPUS brachiatus? *Ag. Sp. Alg.* vol. ii. p. 42.

HAB. Parasitical on the smaller Algæ, between tide-marks. Annual. Summer. Rare. Appin, on *Cladophora rupestris, Capt. Carmichael.* Sidmouth and Torquay, on *Ptilota sericea, Mrs. Griffiths.* Bantry Bay, *Miss Hutchins.* Land's End, Mount's Bay, Ilfracombe, and Milford Haven, all on *Ptilota sericea;* Menai Bridge, on *Cladophora rupestris, Mr. Ralfs.* In a narrow, darkened chasm, on east side of Eda, Orkney, parasitical on *Ptilota sericea,* and *Clad. rupestris, Lieut. F. W. L. Thomas* and *Dr. Mc Bain.*

GEOGR. DISTR. British Islands. Baltic Sea?

DESCR. *Filaments* densely tufted, capillary, one to three inches high, straightish, the tufts somewhat spiry; main threads somewhat matted together, the branches free, many times divided. Lesser branches short, opposite, or in fours, very patent, furnished at distant intervals with pairs of short opposite spine-like ramuli. Apices attenuated but not very acute. *Spores* spherical, dark olive, with a pellucid border, sessile, borne on the sides of the branches, and opposite to each other or to a ramulus; each spore, in fact, occupying the normal position of a ramulus, and substituted for one on fertile specimens. *Articulations* about as long as broad, semitransparent, with a few large grains. *Colour* olivaceous, or rusty, or yellowish-brown. *Substance* flaccid, closely adhering to paper, wholly without gloss when dry.

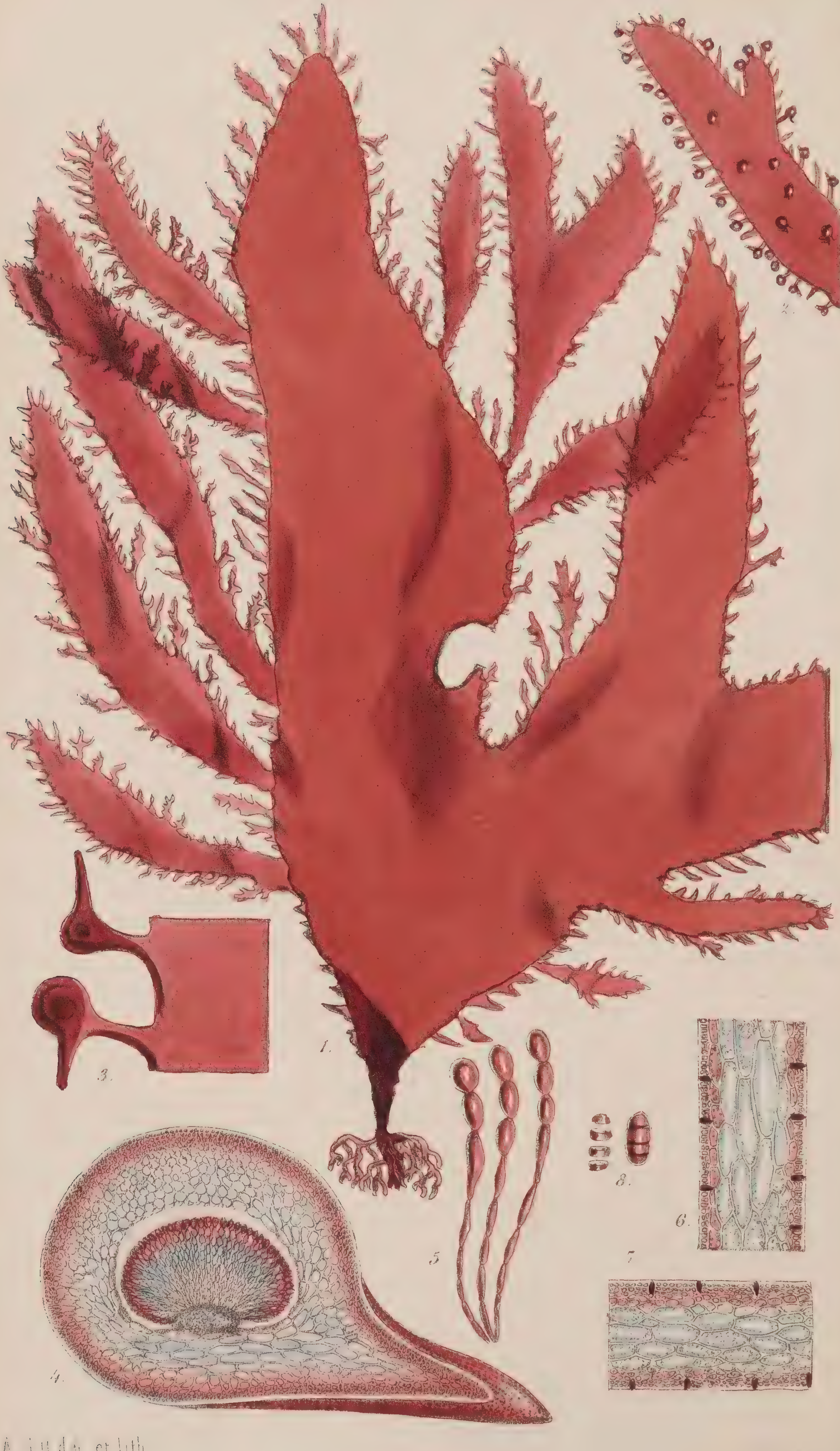
This species was first observed by the late Capt. Carmichael, on the western shores of Scotland, about the year 1824; since which period it has been detected in many other localities between Orkney and Cornwall, but is nowhere a common plant, and where it does occur, it is "not diffused", as Mr. Ralfs well observes, "throughout the bay, but is confined to the space of a few rocks, on which it forms, as it were, a colony, or is gregarious." It appears by no means indifferent to what plant it attaches its fronds, being very generally found growing on *Ptilota sericea,* though frequently also on *Cladophora rupestris.* I am not aware that it ever infests any other Algæ.

The nearest affinity is with *E. brachiatus* (Pl. IV.), from which it is most readily known by the difference in the fruit, the spores being in that species lodged in swellings or enlargements of the smaller branches in the axils of the opposite ramuli; and in this being formed by a metamorphosis of the ramuli themselves. My friend, Professor Kützing, strongly urges that this difference indicates, not a different species, but a different condition of the same species: in like manner as the two modes of fructification found in the *Florideæ* are not to be regarded as specific characters. There is something, certainly, still to be cleared up respecting the fructification of the *Ectocarpi,* to reconcile the varying appearances which the organs of reproduction assume in different species. Nevertheless I am disposed to retain the present species distinct from *E. brachiatus,* at least, until their identity be proved; because, independently of fructification, there is a difference in aspect, more readily seen than described in words, and because they are found as parasites upon *different* Algæ. Both species have been collected and observed by very accurate botanists, who do not find them intermixed, and are firmly persuaded that they are essentially different.

Dr. J. D. Hooker brought from Cape Horn an *Ectocarpus* (*E. geminatus,* Hook. fil. et Harv.) closely resembling our *E. sphærophorus,* and also forming spores by an alteration of the ramuli; but its spores are of a conical, not spherical, form. It would be very interesting should future observations detect this analogous species on the shores of the Shetland Islands.

Fig. 1. ECTOCARPUS SPHÆROPHORUS; a tuft:—*of the natural size,* growing on a fragment of *Ptilota sericea.* 2. Portion of a branch. 3. Ramuli, with spores:—*both magnified.*

Plate CXXVII



W.H.H. del. et lith.

PLATE CXXVII.

RHODYMENIA CILIATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick cellular pericarp, and containing a mass of minute spores, on a central placenta. 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ῥόδεος, *red*, and ὑμην, a *membrane.*

RHODYMENIA *ciliata*; frond thick, subcartilaginous, dull purplish-red, rising from a short stalk, lanceolate or forked, irregularly pinnated with lanceolate or bifid segments, which are attenuated at base; the margin, and often the disc, more or less furnished with subulate cilia, in which the tubercles are imbedded; tetraspores collected in cloud-like patches dispersed over the disc; root branching.

RHODYMENIA ciliata, *Grev. Alg. Brit.* p. 90. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 67. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 62. *Endl. 3rd Suppl.* p. 51.

CALLIBLEPHARIS ciliata, *Kütz. Phyc. Gen.* p. 404. t. 62. III.

DELESSERIA ciliata, *Lamour. Ess.* p. 37.

HALYMENIA ciliata, *Gaill. Dict. Sc. Nat.* v. 53. p. 361.

SPHÆROCOCCUS ciliatus, *Ag. Syn.* p. 28. *Lyngb. Hyd. Dan.* p. 12. t. 4. *Ag. Sp. Alg.* vol. i. p. 263. *Ag. Syst.* p. 221 *Spreng. Syst. Veg.* vol. iv. p. 334. *Hook. Fl. Scot.* part 2. p. 103.

FUCUS ciliatus, *Linn. Mont. Pl.* p. 136 and 519 (*excl. syn. Gmel.*). *Syst. Nat.* p. 718. *Huds. Fl. Ang.* p. 580. *Lightf. Fl. Scot.* p. 944. *Stack. Ner. Brit.* p. 90. t. 15. *Turn. Syn.* vol. i. p. 169. *Sm. E. Bot.* t. 1069. *Turn. Hist. Fuc.* t. 70. fig. *a–e.* *Linn. Trans.* vol. iii. p. 160. *Hook. Iceland Tour.* vol. ii. p. 347.

HAB. On rocks, in pools near low-water mark, and at a greater depth. Annual. Fruiting in winter. Frequent on the shores of England and of the south and west of Ireland. Near Belfast, *Dr. Drummond.* Rare in Scotland. Iona, *Lightf.* Elwich Harbour and Shapinsha, Orkney, *Lieut. Thomas* and *Dr. Mc' Bain.* Jersey, *Miss White* and *Miss Turner.*

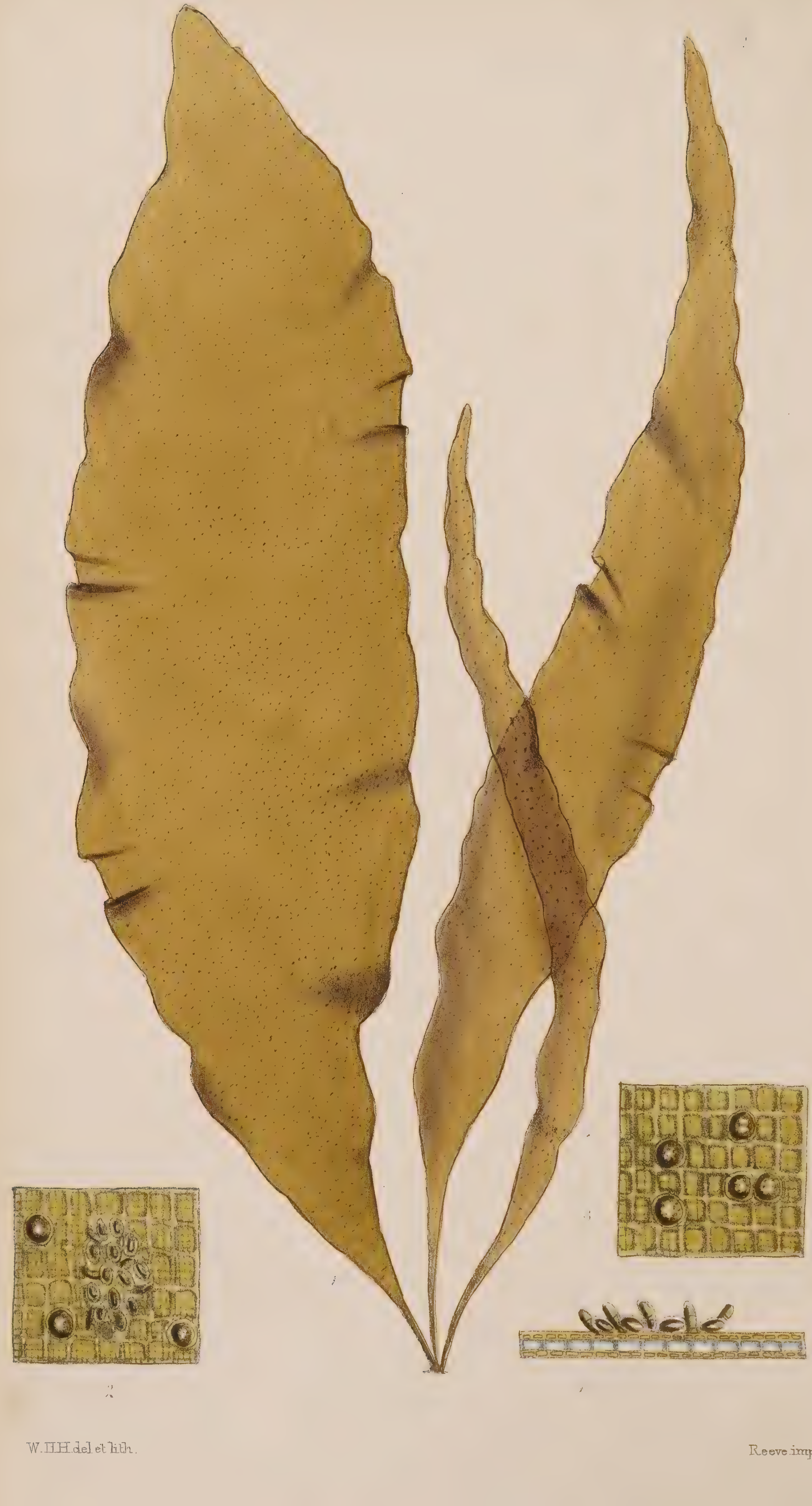
GEOGR. DISTR. Northern Atlantic Ocean, along the shores of Greenland, Iceland, the Fœroe Islands, and of Europe from Norway to Spain.

DESCR. *Root* composed of pale red, branching and grasping fibres. *Fronds* tufted, six to twelve inches long, rising from a short, cylindrical, simple, or rarely forked stem, variable in form. In some individuals the frond forms a simple, ovato-lanceolate subacute leaf, cuneate at base, and dentato-ciliate along the margin, but destitute of lobes; in others the main frond is once or twice forked, one to two inches broad, and more or less furnished with lateral lanceolate segments, with the margin in every part jagged in a manner between dentate and ciliate, some of the cilia short and subulate, others more or less prolonged into lobes, which are themselves dentato-ciliate. Other specimens have the main frond somewhat palmately parted, the principal divisions from a quarter to half an inch wide, and closely pinnatifid with numerous patent laciniæ, as wide as the main division, lanceolate and dentato-ciliate, acute, and much attenuated at base. The surface of the frond is either smooth or more or less muricated with cilia. *Substance* thick, rigid and crisp when recent, imperfectly adhering to paper in drying. *Colour* a deep, full red, semi-transparent when fresh, becoming much darker in the herbarium. The cells of the interior are oblong or narrow elliptical, in several rows, rather large and filled with large grains. *Tubercles* constantly lodged in the marginal cilia, near the apex, which is turned aside and projects like the bill of a bird. The sporular mass is beautifully arranged in moniliform strings, radiating from a central point; the terminal cells being at length formed into spores. *Tetraspores* forming cloud-like stains in various parts of the frond, oblong, transversely zoned.

* * *

Rhodymenia ciliata is of a thicker substance, and more rigid than any other British species of this genus, and is, moreover, distinguished from all of them, except *R. jubata*, by the fibrous character of the root. *R. jubata*, indeed, was long considered to be merely an extraordinary variety of *R. ciliata* until characters were satisfactorily ascertained by Mrs. Griffiths, which seem permanently to separate it. These consist in a softer substance, a duller colour, and a difference in the fructification, and also in the season at which the plant is in perfection. It is only the smaller and narrower varieties of *R. ciliata* which can be confounded with *R. jubata*; the more usual form, which our plate represents, looks abundantly different.

Fig. 1. RHODYMENIA CILIATA. 2. A segment in fruit:—*both of the natural size.* 3. Fertile cilia, with tubercles. 4. Section of a tubercle. 5. Strings of spores, from the same. 6. Longitudinal section of the frond. 7. Transverse section. 8. Tetraspores:—*all more or less magnified.*



W. H. H. del et lith.

Reeve imp.

PLATE CXXVIII.

PUNCTARIA PLANTAGINEA, *Grev.*

GEN. CHAR. *Frond* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent spores, intermixed with club-shaped filaments. PUNCTARIA (*Grev.*),—from *punctum*, a *dot*; the fruit being in dots, scattered over the surface.

PUNCTARIA *plantaginea*; frond lanceolate or obovato-lanceolate, cuneate and gradually attenuated at base, brownish olive, coriaceo-membranaceous.

PUNCTARIA plantaginea, *Grev. Alg. Brit.* p. 53. t. 9. *Hook. Br. Fl.* vol. ii. p. 278. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man.* p. 33. *Wyatt, Alg. Danm.* no. 206. *Endl. 3rd Suppl.* p. 25.

DIPLOSTROMIUM plantagineum, *Kütz. Phyc. Gen.* p. 298.

ZONARIA plantaginea, *Ag. Sp. Alg.* vol. i. p. 138. *Ag. Syst.* p. 268. *Spreng. Syst. Veg.* vol. iv. p. 326.

ULVA plantaginea, *Roth, Cat. Bot.* vol. ii. p. 243 and vol. iii. p. 326. *E. Bot.* t. 2136.

ULVA plantaginifolia, *Wulf. Crypt.* no. 3. *Lyngb. Hyd. Dan.* p. 31. t. 6.

LAMINARIA plantaginea, *Ag. Syn.* p. 20.

HAB. On rocks and stones, between tide-marks, and in rocky tide pools; occasionally on Algæ. Annual. Spring and summer. Not uncommon on the English and Irish coasts. Frith of Forth, *Dr. Greville.* Orkney, *Rev. J. H. Pollexfen.* Calf Sound, Orkney, in four fathom water, *Lieut. Thomas* and *Dr. Mc Bain.*

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* small, scutate. *Fronds* densely tufted, from four to twelve inches in length, varying in breadth from less than a quarter of an inch to more than two inches, lanceolate or ovato-lanceolate, more or less tapering to an obtuse or subacute point, cuneate and very much attenuated below, passing by insensible gradations into a minute, setaceous stem. In a young state both surfaces of the frond are clothed with exceedingly tender, subgelatinous, transparent filaments, which give it a peculiarly soft feel, and make the substance appear much thicker than it really is. These gradually wear off as the plant attains its full size. The colour varies from a deep olive to a reddish brown. The surface of the frond is beautifully areolated, the larger cells of the interior being seen through those of the outer coat. *Dots* of fructification, scattered over the whole surface, very minute, somewhat oblong, consisting of several elliptical spores, occasionally accompanied by a few short filaments. Roundish spore-like organs (*antheridia*?) are found on the same plants that produce the regular fructification. They are of larger size than the true spores, irregularly placed, depressed, pale coloured, and contain a granular matter.

By contrasting the figure here given with our representation of *P. latifolia* at Plate VIII., the difference between typical forms of these plants will be readily seen, the present being characterised by its dark colour, cuneate base, and more lanceolate general outline. I wish it could be said that such characters admitted of no approximation to their opposites. But though specimens may be collected in plenty in which these peculiarities can clearly be seen; yet it must be admitted that other individuals are frequently found which show them in a more or less weakened state, and approach in greater or less degree to some of the forms of *P. latifolia,* so that, on the whole, I am disposed to consider these species as not permanently distinguishable from each other. If we take merely the extreme forms of each, such an opinion will appear strange, but it is not arrived at without consideration, and a careful comparison of a great number of specimens from different localities, and collected at different seasons of the year. Nevertheless, as many botanists think differently, and among them my accurate and experienced friend Mrs. Griffiths, I deem it right to retain both species in this work, and to give, of each, such figures as will clearly point out the characters severally attributed to their typical conditions.

Fig. 1. PUNCTARIA PLANTAGINEA; plants:—*of the natural size.* 2. Portion of the surface, with a *sorus.* 3. Portion, with *antheridia*? 4. Section of the frond:—*all magnified.*

Plate CXXIX

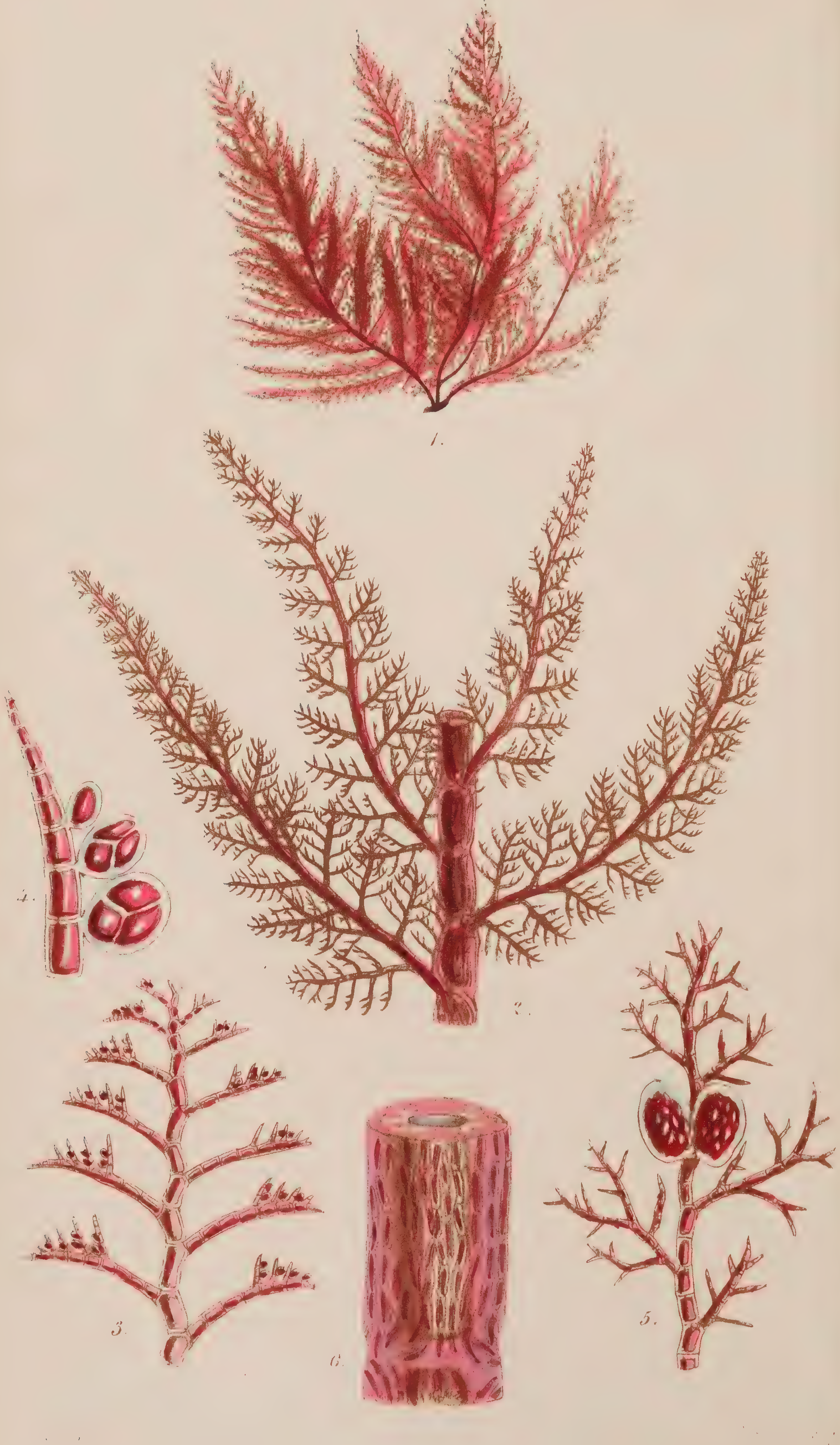


PLATE CXXIX.

CALLITHAMNION BRODIÆI, *Harv.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles *(favellæ)* seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from κάλλις, *beautiful*, and θαμνίον, a *little shrub*.

CALLITHAMNION *Brodiæi*; stem sub-opake, veiny, obscurely jointed, slender, simple, furnished throughout with densely inserted, patent, lateral branches; branches furnished at each joint, with short, quadrifarious, secondary-branches with a narrow hastate outline; plumules alternate, subsimple, pinnate, ovate, their pinnules patent, frequently with a few secund processes near the apex; tetraspores oval, sessile near the tips of the pinnules, or on their accessory processes; favellæ bilobed, on the secondary branches.

CALLITHAMNION Brodiæi, *Harv. in Hook. Br. Fl.* vol. ii. p. 105. *Harv. Man.* p. 105. *Wyatt, Alg. Danm.* no. 184.

HAB. Parasitical on Algæ, near low-water mark. Annual. Summer. Rare. Forres, *Mr. Brodie.* Coast of Northumberland, *Mr. Robertson.* Torquay, *Mrs. Griffiths* and *Miss Cutler.* Cornwall, *Mr. Ralfs.*

GEOGR. DISTR. British Islands.

DESCR. *Root* disciform. *Fronds* tufted, from one to three inches high, with a conical outline. *Stem* mostly simple, as thick as hog's bristle, smooth, or in old specimens slightly shaggy, opake below, more or less evidently jointed above, the joints full of longitudinal veins, furnished throughout their length with very closely set, lateral, quadrifarious, patent branches, the lowermost of which are longest, the rest gradually shorter upwards. *Branches* more or less evidently jointed, the joints twice or thrice as long as broad, and full of veins, simple, like the stem, and like it densely clothed with a second, and in luxuriant specimens, a third series of lesser branches, gradually decreasing in size, but of a similar character. These secondary branches have a very narrow hastate outline, and are plumulate at every joint, the plumules somewhat spirally alternate, gradually diminishing in size and composition from the base to the apex. *Plumules* small, ovate, pinnate, sessile, with a flexuous rachis; their pinnules simple, patent, or erecto-patent, often furnished with a few secund processes towards the apex; apices sub-acute. *Joints* of the plumules once and a half to twice as long as broad. *Tetraspores* oval, sessile, one or two together, on the processes of the pinnules. *Favellæ* generally two-lobed, large, irregularly bursting out of the sides of the lesser branches, which are then frequently distorted. *Colour* brownish-red. *Substance* cartilagineo-membranaceous, rather firm, adhering, but not very closely, to paper, and without gloss when dry.

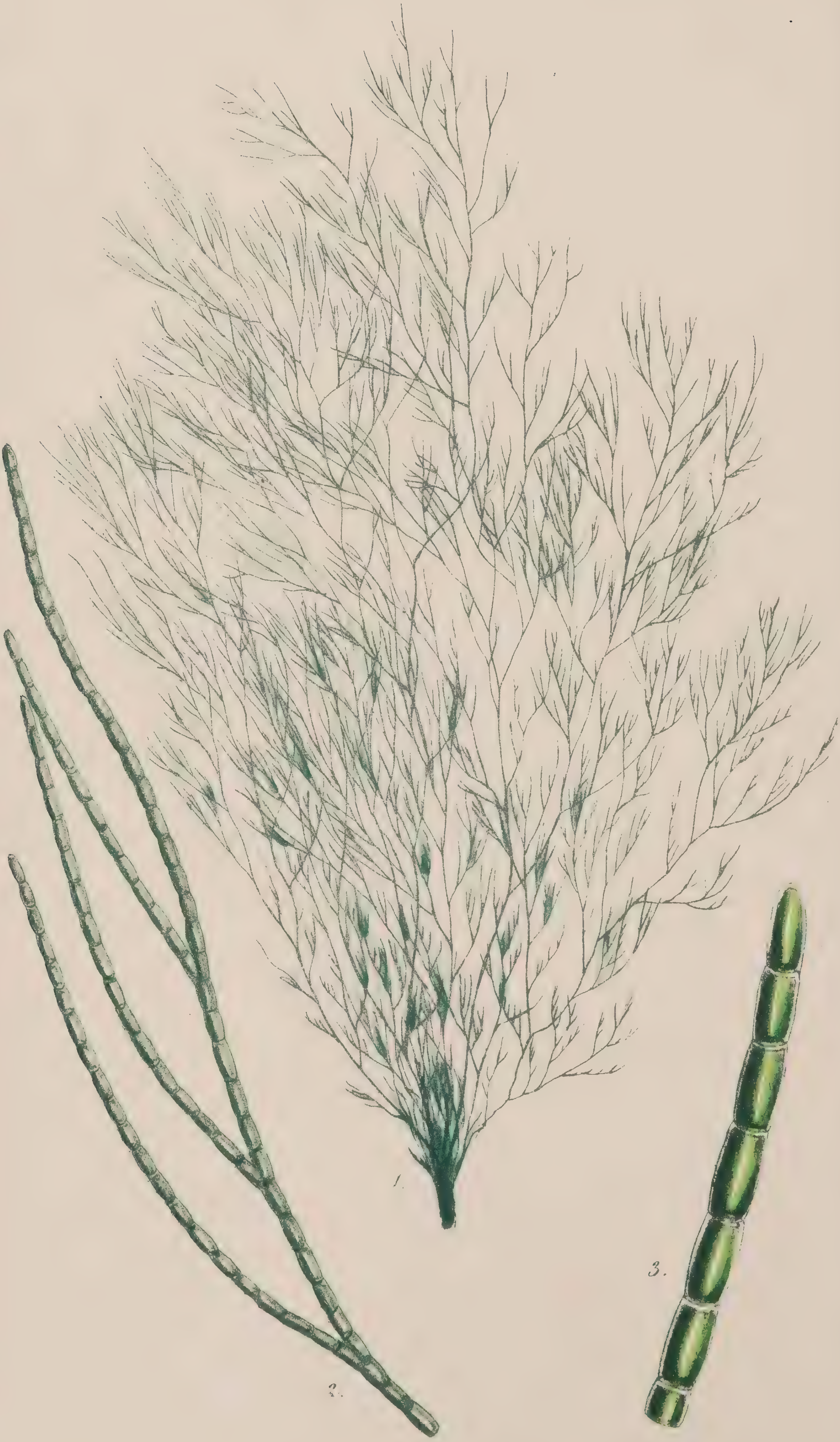
* * *

This pretty species appears to have been first found, nearly half a century ago, by the late Mr. Brodie of Brodie, whose name it deservedly bears. Mr. Brodie, indeed, considered it identical with the *Conferva purpurascens* of Hudson: a doubtful synonyme, referred by Agardh to his *Cal. versicolor,* and applied by Sir James E. Smith ('E. Bot.' t. 2465.) to a plant found on the beach at Brighton by Mr. Borrer, which, to judge by the figure, has most of the characters of *C. roseum.* Hudson's brief description is insufficient, in the absence of authentic specimens, to ascertain the plant he had in view, and, therefore, when describing the present species in the 'British Flora' I assigned to it a new name.

Cal. Brodiæi has much the habit of a small specimen of *C. tetragonum*; the conical outline, undivided shrubby stem and lateral branches, are common to both. But the microscopic characters show a much nearer affinity with *C. Hookeri,* to some varieties of which it make a very near approach. In the individuals producing *tetraspores,* which are always more slender, and more regularly branched than those which bear *favellæ,* the pinnules are pretty constantly furnished with short, secund ramuli in their upper half. In *C. Hookeri* such ramuli are either absent or are alternate, and more patent. In the length of the joints there is not much difference, and both species have sub-opake stems, traversed by densely packed articulated veins. I have not received any specimens of *C. Brodiæi* from the continent, nor am I aware that it has been found out of Britain.

Fig. 1. Callithamnion Brodiæi:—*of the natural size.* 2. Portion of a branch, with secondary branches. 2. A plumule. 4. Tetraspores, *in situ.* 5. Branchlet with a *favella.* 6. A portion of one of the main branches, showing the veins:—*all more or less highly magnified.*

Plate CXXX



W.H.H. del. et lith.

Reeve imp.

PLATE CXXX.

CLADOPHORA DIFFUSA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having at some period a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλάδος, a *branch*, and φορέω, to *bear*.

CLADOPHORA *diffusa*; filaments sub-setaceous, loosely tufted, rigid, dark or full green, flexuous, much branched; branches distant, elongated, irregularly subdivided, or somewhat dichotomous, furnished towards the top with a few secund, simple ramuli; articulations 3–4 times longer than broad.

CONFERVA diffusa, *Roth, Cat. Bot.* vol. ii. p. 207. t. 7. *Dillw. Conf.* t. 21. *E. Bot.* t. 2289. *Ag. Syst.* p. 116. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 136. *Wyatt, Alg. Danm.* no. 144. *J. Ag. Alg. Medit.* p. 13.

CONFERVA distans, *Ag. Syst.* p. 120.

HAB. On rocks and stones between tide marks, and in clear pools near low-water mark. Annual. Summer. Near Swansea, *Dillwyn*. Torbay, *Mrs. Griffiths*. Falmouth, *Miss Warren*. Aberffraw, *Mr. Ralfs*. Sidmouth, *Rev. R. Cresswell*. Malbay, *W. H. H.*, and in other places. Port Rush, *Mr. Moore*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Filaments* from six to twelve inches long, or more, as thick as horsehair, cylindrical, equal, loosely tufted, generally so rigid as to bristle and stand out, one from another, when removed from the water; occasionally flaccid, flexuous, much branched. *Branches* rather distantly placed, long, irregularly subdivided in a manner between alternate and dichotomous, sometimes repeatedly, sometimes but slightly branched, the lesser divisions either long, simple, and quite naked, or bearing towards their extremities a few simple secund ramuli. *Joints* tolerably uniform in all parts of the frond, twice, thrice or four times as long as broad. *Colour*, when young, a full and rather dark, glossy green, afterwards paler and more yellowish. In drying, the plant adheres, but not strongly, to paper.

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The *Conferva diffusa* of British authors, here figured, is, perhaps, scarcely sufficiently distinct from *Cladophora Hutchinsiæ*, represented in Plate CXXIV. As already remarked, it is more slender than the typical form of that species, its branches are less frequently divided, the ramuli longer, more distant and simple, the joints longer, and the substance less firm and rigid.
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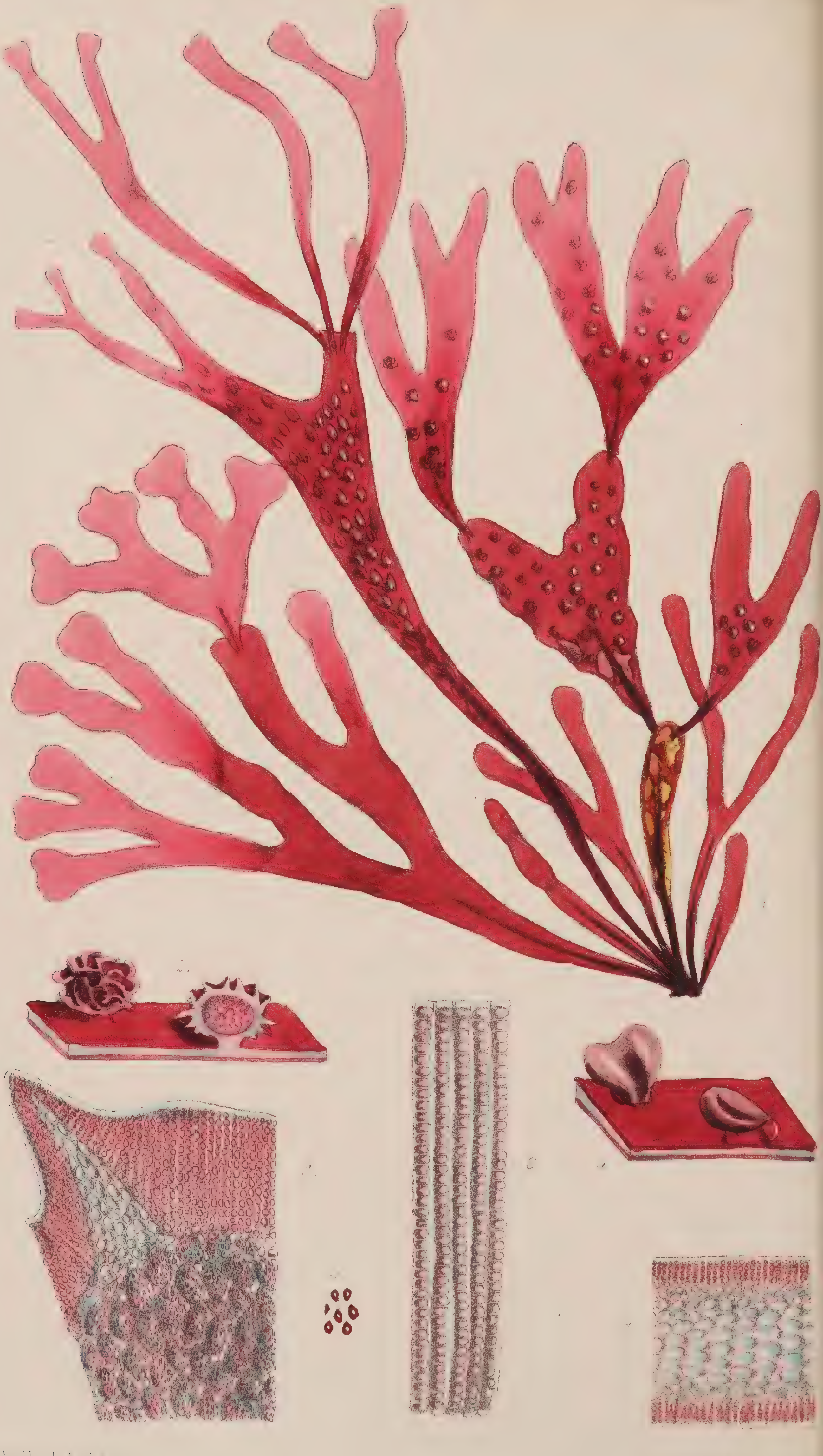
Still specimens frequently occur which seem to connect the two.

This species was discovered by the late Professor Mertens, on the coast of Holland, about the close of the last century, and first published by Roth, in his 'Catalecta.' Mr. Dillwyn soon afterwards detected it near Swansea. It does not appear to be uncommon on the rocky parts of our shores, growing generally in clear water, and most frequently in deep pools near low-water mark. Seen under water it has much of the glaucous colour of *C. Hutchinsiæ*; sometimes it occurs of a darker green, and then approaches some of the less branched forms of *C. rupestris*, but is a larger and stronger growing plant.

Fig. 1. CLADOPHORA DIFFUSA:—*of the natural size.* 2. Part of a filament. 3. Apex of a branchlet:—*both magnified.*

Plate CXXXI



W. H. H. del. et lith.

PLATE CXXXI.

PHYLLOPHORA RUBENS, *Grev.*

GEN. CHAR. *Frond* stipitate, rigid-membranaceous, proliferous, nerveless, or with a vanishing nerve, cellular; cells minute, angular, gradually smaller towards the surface. *Fructification*; 1, *tubercles (favellidia)* scattered over the frond, containing masses of minute spores; 2, *warts* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length converted into spores? 3, *tetraspores* (on distinct plants) collected into sori, either towards the apex of the frond or in proper leaflets. PHYLLOPHORA (*Grev.*),—from φύλλον, a *leaf*, and φορέω, to *bear*.

PHYLLOPHORA *rubens*; stem very short, expanding into a sub-linear or cuneate, simple or forked, rigidly membranaceous, obscurely midribbed frond, which is repeatedly proliferous from the surface; tubercles scattered, wrinkled or crested with sinuous folds; warts concealed under leafy processes.

PHYLLOPHORA rubens, *Grev. Alg. Brit.* p. 135. t. 15. *Hook. Br. Fl.* vol. ii. p. 303. *Wyatt, Alg. Danm.* no. 29. *Harv. in Mack. Fl. Hib.* part 3, p. 202. *Harv. Man.* p. 79. *Endl. 3rd Suppl.* p. 38. *Kütz. Phyc. Gen.* p. 412.

SPHÆROCOCCUS rubens, *Ag. Sp. Alg.* vol. i. p. 237. *Ag. Syst.* p. 213. *Hook. Fl. Scot.* part 2. p. 102. *Grev. Fl. Edin.* p. 296. *Spreng. Syst. Veg.* vol. iv. p 335.

CHONDRUS rubens, *Lyngb. Hyd. Dan.* p. 18.

DELESSERIA rubens, *Lamour. Ess.* p. 38.

FUCUS rubens, *Linn. Sp. Pl.* p. 1630. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 165. *Turn. Syn.* vol. ii. p. 216. *Turn. Hist.* t. 12. *E. Bot.* t. 1053. *Stack. Ner. Brit. ed.* 2. t. 19. *Hook. Iceland Tour*, vol. ii. p. 347.

FUCUS prolifer, *Lightf. Fl. Scot.* p. 949. t. 30. *Esper, Ic. Fuc.* t. 129.

FUCUS epiphyllus, *Fl. Dan.* t. 708.

FUCUS crispus, *Huds. Fl. Ang.* p. 580.

HAB. On the shelving, rocky sides of deep tide pools near low-water mark, under the shadow of *Laminariæ*; also on rocks, stones and nullipores, beyond tide marks, from four to fifteen fathoms. Perennial. Winter. Frequent on the British coasts, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic coasts of Europe from Iceland to Spain. Baltic Sea.

DESCR. *Root* an expanded callus. *Fronds* densely tufted, from three to eight or ten inches in length, rising with a short cylindrical stem, which gradually passes into the flattened, obscurely mid-ribbed, attenuated base of a linear-wedge-shaped lamina; this primary lamina is sometimes quite simple, but is more frequently forked, and often many times dichotomous, each segment being linear and very obtuse. The width of the segments is commonly about a quarter of an inch, but some varieties are nearly an inch broad. The narrower ones are always the longest. From the primary leaf spring numerous other leaves, of similar form, all of them minutely stipitate and furnished with a more or less obvious mid-rib in their lower part. *Tubercles* densely scattered over the surface of the fronds, or forming lines within the margin, spherical, fixed by a narrow base, everywhere covered with sinuous plates or folds, which give them a very wrinkled aspect; containing, under a thick pericarp composed of vertical filaments, a spherical deep-red mass, consisting of innumerable minute spores, collected in small parcels, several of which make up the aggregate mass. *Nemathecia* concealed under leafy obovate processes, which are thickly dispersed over the surfaces of distinct plants, formed altogether of moniliform filaments, which I have not observed to be converted into spores. *Tetraspores* unknown. *Colour* a fine, full deep-red, becoming darker in drying. *Substance* rigid, tough, and not adhering to paper in drying. The plant may be kept in fresh water a considerable time without injury.

A common species on all the rocky shores of Northern Europe, growing at the extremity of low-water mark under the ledges of shelving rocks, in places where it is seldom exposed either to the sun or air. When free from parasites, which is rarely the case, its clear red colour, and glossy surface render it a very ornamental plant. More usually it is disfigured by *Melobesiæ* and *Flustræ*, so as to destroy much of its beauty. It is very closely allied to the *P. nervosa* of the south of Europe, which chiefly differs in having a more strongly marked mid-rib, and a more undulating margin, characters which vary considerably in different specimens. Some specimens of *P. nervosa*, such as those represented in Turner's figure, do indeed look very different from our plant, but others in my possession exhibit scarcely a more definite nerve than is found in many British specimens of *P. rubens*.

Fig. 1. PHYLLOPHORA RUBENS:—*of the natural size.* 2. Tubercles, attached to the frond. 3. Section of a tubercle. 4. Spores. 5. Leafy processes, with *nemathecia* at their base. 6. Filaments from one of the nemathecia. 7. Section of the frond, showing the cells of which it is composed:—*all more or less magnified.*

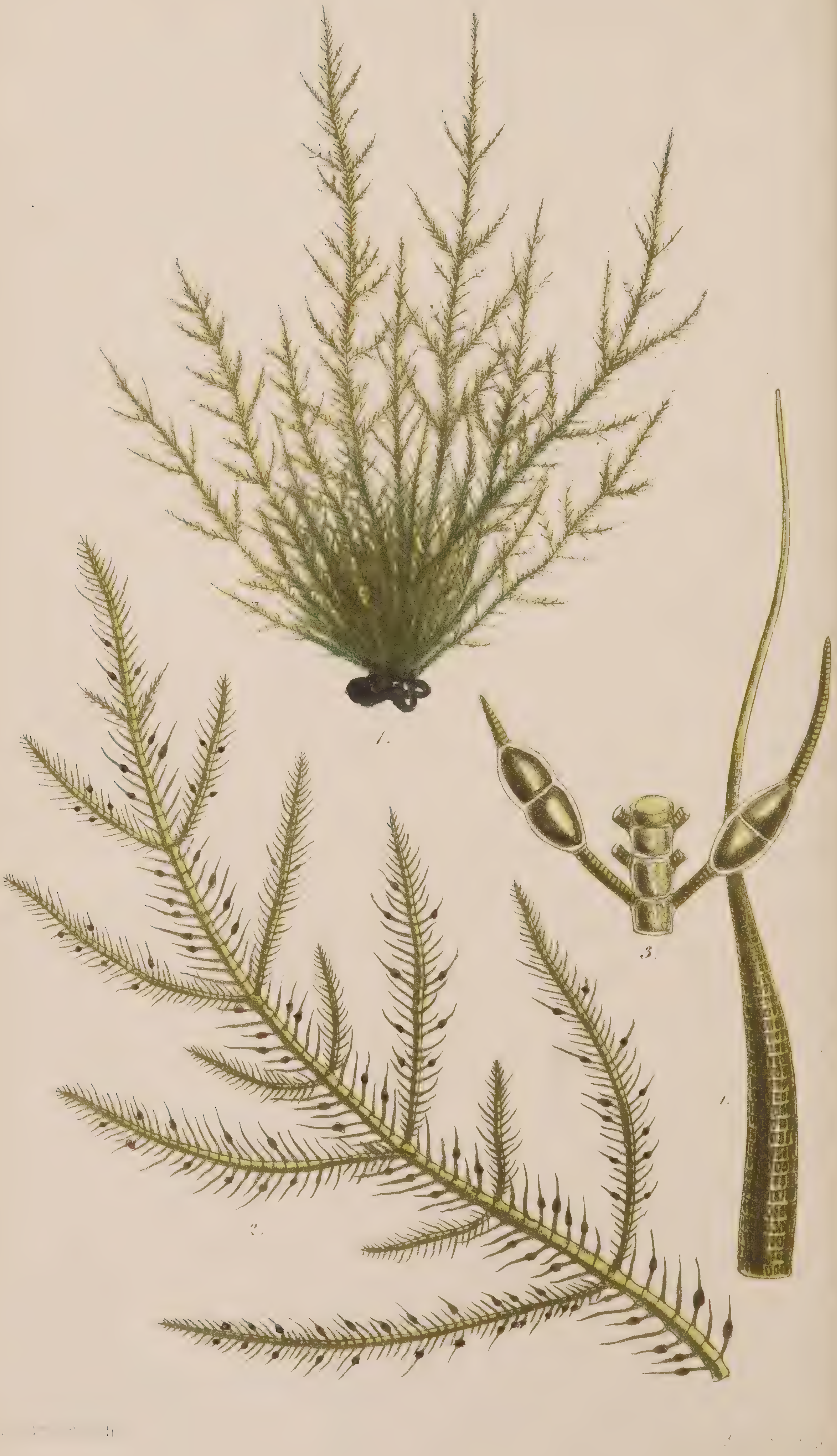

1.
2.
3.
4.

PLATE CXXXII.

ECTOCARPUS MERTENSII, *Ag.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from ἐκτὸς, *external*, and καρπὸς, *fruit*.

ECTOCARPUS *Mertensii*; distichous; branches opposite, of unequal length, linear, mostly undivided, closely set, throughout their whole extent with slender, subulate, opposite ramuli; joints of the stem longitudinally striate, transparent, with a central coloured band, rather shorter than their breadth; spores binate, imbedded in the ramuli.

ECTOCARPUS Mertensii, *Ag. Sp. Alg.* vol. ii. p. 47. *Hook. Br. Fl.* vol. ii. p. 327. *Wyatt, Alg. Danm.* no. 130. *Harv. Man.* p. 43. *Endl.* 3rd *Suppl.* p. 21.

CONFERVA Mertensii, *E. Bot.* t. 999. *Dillw. Conf. Suppl.* p. 79.

HAB. On mud covered rocks and stones, near low-water mark and at a greater depth. Annual. April and May. Rare; but pretty generally distributed. Yarmouth, *Mr. Wigg.* Coast of Durham, *Mr. W. Backhouse.* Torbay, *Mrs. Griffiths.* Salcombe, very fine, *Mrs. Wyatt.* Sidmouth, *Miss Cutler.* Marazion and Ilfracombe, *Mr. Ralfs.* Mount Edgecumbe, Plymouth, *Rev. W. S. Hore* and *Mr. Rohloff.* Bantry Bay, *Miss Hutchins.* Dredged in Strangford Lough, *Mr. W. Thompson.* Howth, *Dr. Coulter.* Cove of Cork and Malahide, *W. H. H.* Carrickfergus and Roundstone Bay, *Mr. Mc Calla.* Orkney, *Rev. J. H. Pollexfen.*

GEOGR. DISTR. British Islands. Atlantic shores of France.

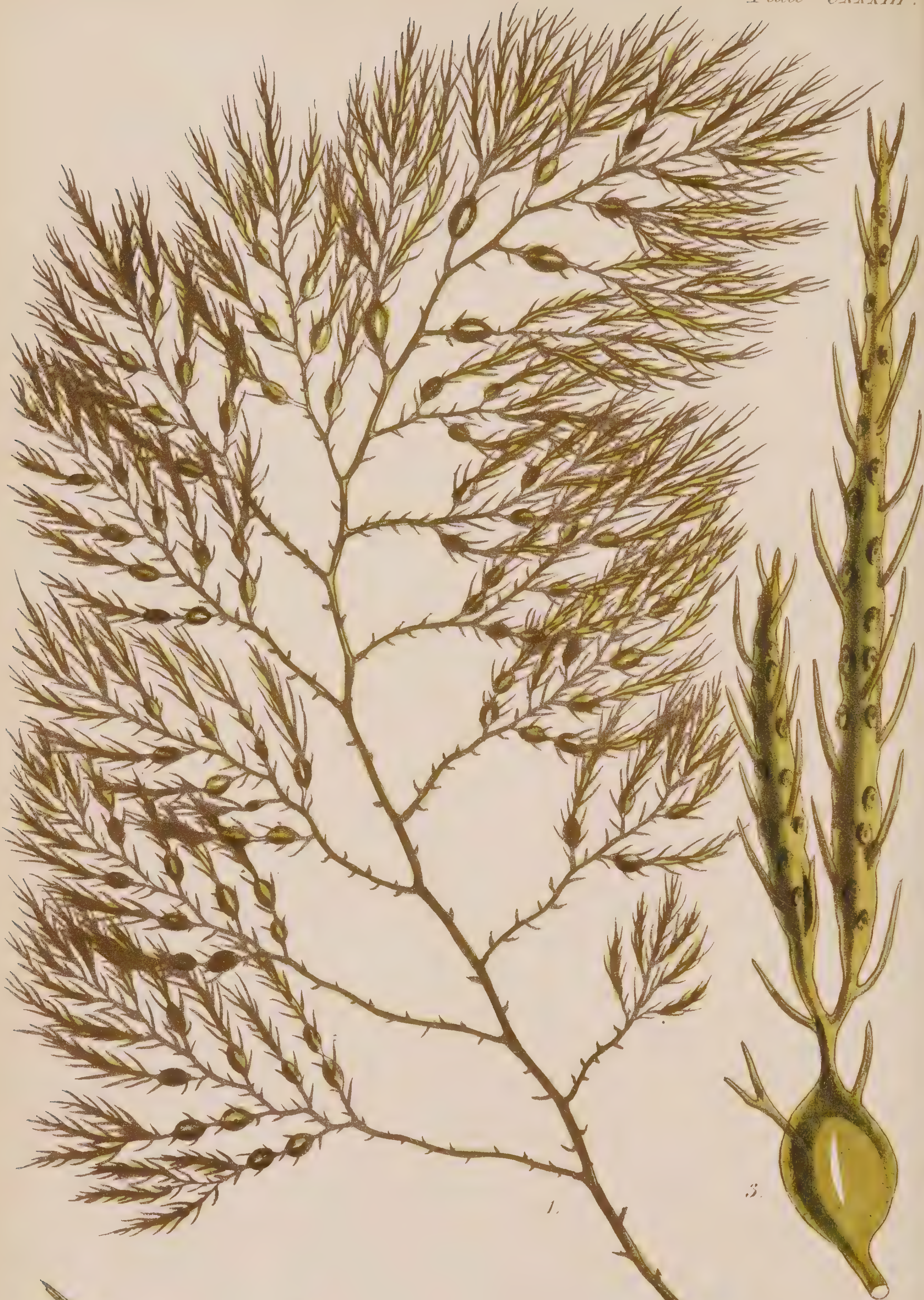
DESCR. *Fronds* densely tufted, but not in the least matted together. *Stems* from two to six, or more rarely twelve inches in length, nearly or entirely simple, closely furnished from the base to the apex with distichous, opposite, erecto-patent, lateral branches, which are of very unequal length, long and short being indiscriminately mixed together. These primary branches are, in large specimens, furnished with a second or third series, also very unequal in length, but none of them long, so that the general outline of the main branch is narrow. Both primary and secondary branches are pectinated, at every joint, with a pair of opposite, subulate, patent ramuli, which in young specimens terminate in a long, hair-like acumination, that drops off at a later period of growth. *Joints* of the stem rather shorter than broad, with a central band; those of the ramuli very many times shorter than broad, each formed of several cellules. *Spores* immersed in the subulate ramuli about the centre, growing in pairs, separated by a transparent line, each spore of a half ellipsoid shape, dark olive. *Colour*, when young, a clear brown olive, becoming foxy when old, and acquiring a greenish shade, if dried after some steeping in fresh water. *Substance* flaccid. The plant closely adheres to paper.

This charming plant, one of the rarest and most beautiful of the filiform marine Algæ, is one of the many interesting discoveries which we owe to Mr. Lilly Wigg, of Yarmouth, who first gathered it in the year 1799. It was named by Mr. Turner in compliment to the late celebrated Professor Mertens, of Bremen, "as well to bear testimony to his unwearied zeal and extensive knowledge of the confervoid Algæ, as in token of private respect"; and, though not the discoverer of this species, it cannot be questioned that the compliment was very appropriately and justly paid. No botanist of his day, with the exception of Mr. Turner himself, was so deeply skilled in the study of marine botany, as Professor Mertens.

Ectocarpus Mertensii, from the date of its first discovery to the year 1834, was found in such small quantities that it was known to very few botanists, except by the figure in 'Eng. Bot.' In that year it was gathered by Mrs. Griffiths, Miss Cutler, and Mrs. Wyatt, in three stations on the Devonshire coast, and in considerable plenty; and, more recently, it has been detected in many localities by various collectors. In land-locked harbours, such as Salcombe, it attains a very large size, some of Mrs. Wyatt's specimens being upwards of a foot in length. In more exposed places it seldom exceeds three or four inches. It is in greatest beauty in April and May, at which time its fronds are glossy, beautifully feathered and of a clear olive; later in the season it becomes browner, and looses much of the feathery appearance. In some respects it exhibits a transition to *Sphacelaria,* proving the close connection which exists between that genus and *Ectocarpus,* and the little necessity there is for placing them in different families, as is now done by Continental authors.

Fig. 1. ECTOCARPUS MERTENSII :—*of the natural size.* 2. Upper portion of a branch. 3. Fertile ramuli, with the immersed, binate spores. 4. Apex of a young ramulus, ending in a fibre :—*all more or less highly magnified.*

Plate CXXXIII.



W.H.H. del. et lith.

Reeve imp.

PLATE CXXXIII.

CYSTOSEIRA FIBROSA, *Ag.*

GEN. CHAR. *Frond* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing parietal *spores*, and tufted *antheridia*. CYSTOSEIRA (*Ag.*),—from κύστις, a *bladder* and σειρὰ, a *chain*; because the air-vessels are often arranged in strings.

CYSTOSEIRA *fibrosa*; stem woody, compressed, very much branched; branches slender, alternately bi-tri-pinnate, pinnules furnished with linear, setaceous, acute ramuli; vesicles elliptical, solitary or in pairs, immersed in the smaller branches, remote from the apices; receptacles linear, very long, more or less clothed with setaceous ramuli.

CYSTOSEIRA fibrosa, *Ag. Sp. Alg.* vol. i. p. 65. *Ag. Syst.* p. 285. *Spreng. Syst. Veg.* vol. iv. p. 317. *Grev. Alg. Brit.* p. 8. *Hook. Br. Fl.* vol. ii. p. 266. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 19. *Wyatt, Alg. Danm.* no. 52. *Endl. 3rd Suppl.* p. 30. *Fl. Dan.* t. 1902.

PHYLLACANTHA fibrosa, *Kütz. Phyc. Gen.* p. 356.

FUCUS fibrosus, *Huds. Fl. Ang.* p. 575. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 137. *With.* vol. iv. p. 87. *Stack. Ner. Brit.* p. 80. t. 14. *Turn. Syn.* vol. i. p. 93. *Turn. Hist.* t. 209. *E. Bot.* t. 1969. *Lamour. Ess.* p. 18.

FUCUS abrotanoides, *Gmel.* p. 89. *Esper*, p. 65. t. 29.

FUCUS baccatus, *Gmel.* p. 90. t. 3. f. 2. *Esper*, *Ic.* p. 108. t. 54.

FUCUS setaceus, *Huds. Fl. Ang.* p. 575.

HAB. On rocks, near low-water mark and in tide-pools; also in 4–15 fathom water. Perennial. Summer. Frequent on the shores of England and of the north, west, and south of Ireland. Not found in Scotland.

GEOGR. DISTR. Atlantic shores of Europe, from England to Spain.

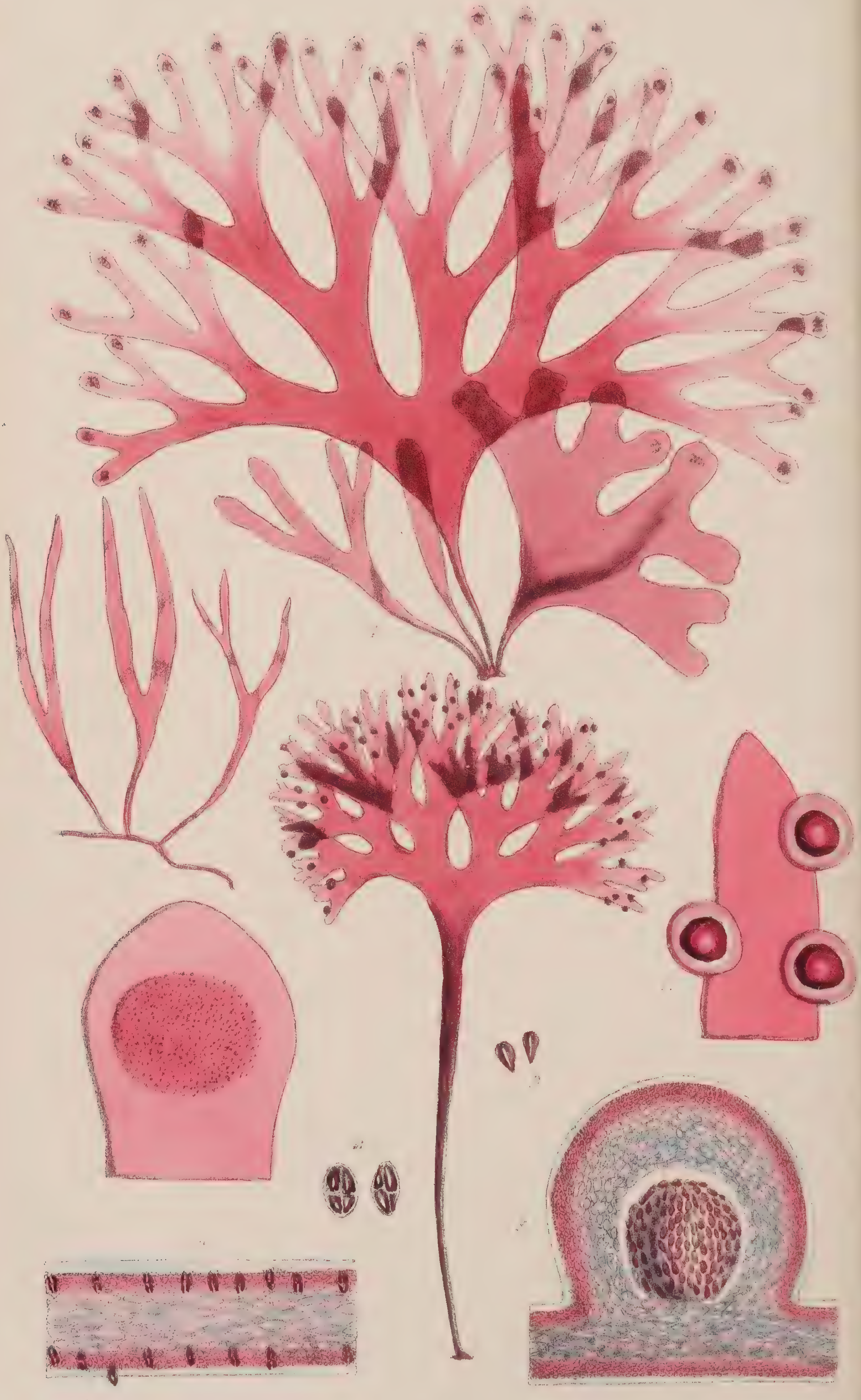
DESCR. *Root* a large, hard, conical expansion. *Fronds* mostly solitary, from two to three feet long, or more, very bushy, and excessively branched. *Main stem* as thick as a swan's quill, simple, or once or twice branched, from six inches to a foot in length, furnished throughout with alternate, subdistichous slender branches, accompanied by more or less numerous, linear, simple or forked, narrow leaves, which are furnished with a mid-rib and attenuated to each extremity. *Branches* from one to two feet in length, as thick as small twine, somewhat compressed, gradually attenuated from the base to the apex, but without any swelling at the base, more or less naked below, and rough with the remains of broken ramuli, closely pinnated above with alternate, distichous branchlets, which in like manner are pinnated with a second, and these with a third series of branchlets, gradually becoming smaller and more slender. In the last series, which are more or less clothed with setaceous simple or forked ramuli, from a quarter inch to upwards of an inch in length, are imbedded one or two elliptical vesicles from one to two lines in diameter. The receptacles terminate most of the lesser branches of fertile specimens, and are often much produced: when young, they are clothed with setaceous ramuli, exactly as the barren pinnules, but become more or less naked in an advanced state, and at length torulose. They contain numerous conceptacles, of the usual structure. *Substance* woody in the stem, coriaceous and tough in the branches. *Colour* a yellowish olive green, becoming black in drying.

This is the largest and finest of the British *Cystoseiræ*, and when grown under circumstances favourable to its full developement, it is a very handsome plant. Our figure represents only the lower part of a stem, and one of the branches. To do full justice to the frond would require a folio plate.

The principal stem near its base, and some of the lower branches, which are shorter and more simple than the rest, produce numerous simple or forked linear, mid-ribbed leaves, one of which is represented at fig. 2. These are borne nearly in the order of the usual ramuli, but sometimes more densely inserted, and almost fasciculate.

From *C. ericoides*, with which only among British species it can be confounded, *C. fibrosa* may always be known by its more slender branches, the large size of its air-vessels, and the very long, filiform receptacles clothed with setaceous ramuli; nor does it exhibit, when growing, those brilliant rainbow tints for which *C. ericoides* is so remarkable. It is by no means so commonly clothed with animal parasites as our other species, but is frequently infested with *Elachistea flaccida*, a plant which I believe to be peculiar to it.

Fig. 1. CYSTOSEIRA FIBROSA. 2. One of the leaves:—*both of the natural size.*
3. Receptacles and vesicle:—*slightly magnified.*



W. Fitch del. et lith.

Reeve imp.

PLATE CXXXIV.

RHODYMENIA PALMETTA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick cellular pericarp, and containing a mass of minute spores, on a central placenta. 2, *tetraspores*, either zoned or tripartite, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ῥόδεος, *red*, and ὑμην, a *membrane*.

RHODYMENIA *Palmetta;* stem cylindrical, sub-simple, expanding into a fan-shaped, rose-red frond, which is more or less deeply cleft in a dichotomous manner; segments linear-wedge-shaped, with broad, rounded interstices, and a very entire, flat margin; apices, according to the state of fructification, either erose or rounded; tubercles sessile, very convex, marginal or scattered; tetraspores cruciate or tripartite, forming deep-red sori in the expanded apices.

RHODYMENIA Palmetta, *Grev. Alg. Brit.* p. 88. t. 12. *Hook. Br. Fl.* vol. ii. p. 290. *Wyatt, Alg. Danm.* no. 109. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 61. *J. Ag. Alg. Medit.* p. 153? *Endl. 3rd Suppl.* p. 51. *Mont. Alger.* p. 68.

SPHÆROCOCCUS Palmetta, *Ag. Sp. Alg.* vol. i. p. 245. *Ag. Syst.* p. 215. *Lyngb. Hyd. Dan.* p. 11. *Spreng. Syst. Veg.* vol. iv. p. 335. *Kütz. Phyc. Gen.* p. 410.

DELESSERIA Palmetta, *Lamour. Ess.* p. 37.

HALYMENIA Palmetta, *Gaill. Dict. Sc. Nat.* vol. 53. p. 361.

FUCUS Palmetta, *Esper, Ic. Fuc.* p. 84. t. 40. (*excl. syn.*) *Stack. Ner. Brit.* p. 102. t. 16. *Turn. Syn.* vol. i. p. 21. *Turn. Hist. Fuc.* t. 73. *E. Bot.* t. 1120.

FUCUS bifidus, *Huds. Fl. Ang.* p. 581.

β. Nicæensis, *J. Ag. l. c.* p. 153.; frond simple, or once forked, very narrow, rising from fibres.

HAB. On rocks near the verge of low water, and at a greater depth, but more frequently on the stems of *Laminaria digitata*. Annual. Summer and autumn. Not uncommon on the British shores from Orkney to Cornwall and Jersey; more abundant in the south and west. β., at Sidmouth, *Mrs. Griffiths and Miss Cutler*.

GEOGR. DISTR. Atlantic shores of Europe from Norway to Spain. Mediterranean Sea. (The southern stations belong, probably, to *R. corallina*.)

DESCR. *Root* a broad, common disc, sometimes accompanied by fibres. *Fronds* densely tufted, rising with a more or less evident, simple or rarely divided stem, cylindrical and filiform below, compressed above, and from a quarter of an inch to one or two inches in length: this stem gradually expands at its summit into a fan-shaped, semicircular lamina, cuneate at base, and more or less deeply and repeatedly cleft into numerous dichotomous, patent segments, with broad, rounded intervals, and more or less obtuse, often very obtuse apices. The lower segments are more or less cuneate, the upper mostly linear, with a perfectly flat and even, entire margin. Sometimes, especially in specimens that bear tubercles, the apices are more or less erose and jagged. In var. β. the disciform root sends out very numerous filiform, branching surculi, from whose sides spring, very irregularly, simple, or once forked, very narrow fronds, attenuated at the apex, and sometimes produced into long, filamentous cirrhi. *Tubercles* globose, seated on the margin or disc of the uppermost segments, with a wide pellucid border, and thick cellular pericarp, containing a very convex mass of angular spores. *Tetraspores* forming deep red blotches in the pale, expanded apices of the segments, cruciate or tripartite. *Colour*, a fine pinky red, preserved in drying. *Substance* membranaceous, somewhat rigid, and very imperfectly adhering to paper in drying.

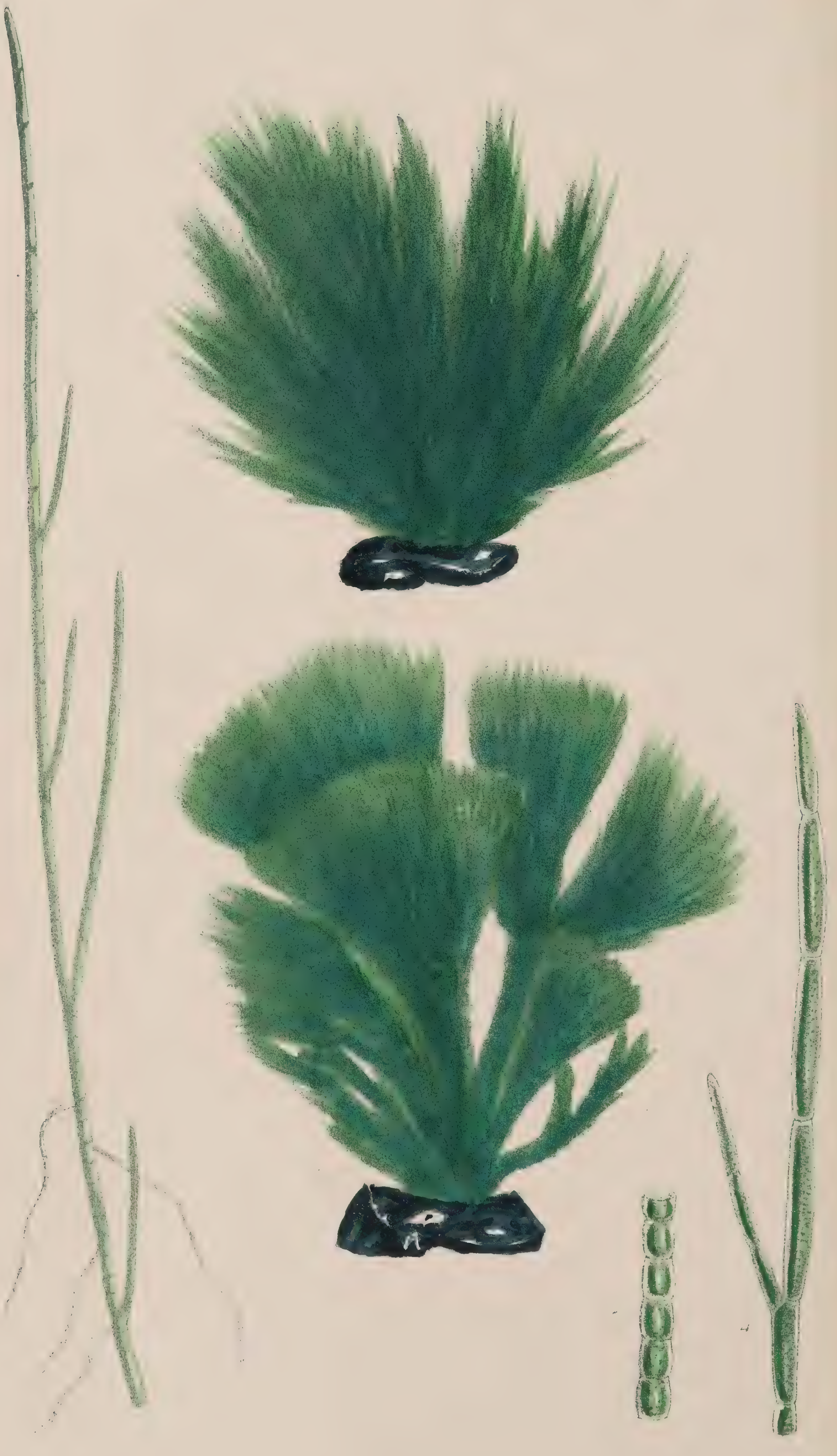
This pretty species, though it varies as to the greater or less division of the frond, generally preserves a tolerably uniform, flabellate outline, which, taken in connexion with its bright pinky colour, and rather rigid, crisp substance, sufficiently distinguishes it from any British species. There are some closely allied forms in the Southern Ocean, as *R. corallina* and *R. flabelliformis*, which it is sometimes more difficult to separate. Among British plants the nearest in form is certainly *R. membranifolia* (*Chondrus membranifolius*, Grev.), but this may always be known by the very different colour, independently of differences in the fructification.

A marked difference exists between specimens which produce tetraspores, and those that bear tubercles, as may be seen by comparing our upper and lower figures. The former are invariably more expanded, with broad and rounded tips; the latter more drawn into a stem with shorter and denser segments, and truncate or abruptly cut tips.

A very remarkable variety, which bears a close resemblance to the var. β. of *Phyllophora Brodiæi*, is noticed above under the name *Nicæensis*, and represented at fig, 3. This always springs from decumbent fibres, which often acquire a considerable length. In the Mediterranean specimens the frond is usually quite simple, prolonged at the apex into a cirrhous appendage. British specimens are more commonly forked, and their apices, though attenuate, seldom produced into a tendril.

Fig. 1. Rhodymenia Palmetta: specimen with *sori* of tetraspores in the tips. 2. Specimen bearing *tubercles*. 3. Var. β.:—*all of the natural size.* 4. Apex of a segment, with sorus. 5. Cross section of the same. 6. Tetraspores. 7. Apex of a segment, with tubercles. 8. Section of a tubercle. 9. Spores:—*all more or less magnified.*

Plate CXXXVI.



Reeve, imp.

Plate CXXXV.

CLADOPHORA ARCTA, *Kütz.*

Gen. Char. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having at some period a proper ciliary motion. Cladophora (*Kütz.*),—from *κλάδος*, a *branch*, and *φορέω*, to *bear*.

Cladophora *arcta*; filaments forming broad, starry tufts, of a brilliant green colour, much branched, and more or less matted together below; branches straight, crowded, very erect; ramuli appressed, opposite or alternate, scattered; articulations in the older parts once or twice as long as broad, in the young (upper) branches many times longer.

Cladophora arcta, *Kütz. Phyc. Gen.* p. 263.

Cladophora vaucheriæformis, *Kütz. l. c.* p. 263.

Cladophora centralis, *Kütz. l. c.* p. 269.

Conferva arcta, *Dillw. Conf. Suppl.* p. 67. t. e. *E. Bot.* t. 2098. *Lyngb. Hyd. Dan.* p. 157. *Ag. Syst.* p. 118. *Harv. in Hook. Br. Fl.* vol. ii. p. 359. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 139.

Conferva centralis, *Lyngb. Hyd. Dan.* p. 161. t. 56. *Ag. Syst.* p. 111. *Fl. Dan.* t. 1777. *Harv. in Hook. Br. Fl.* vol. ii. p. 358.

Conferva vaucheriæformis, *Ag. Syst.* p. 118.

Hab. On exposed sub-marine rocks from half-tide level to low-water mark. Perennial? Spring, summer and autumn. Frequent on the British shores from Orkney to Cornwall.

Geogr. Distr. Abundant on the Atlantic shores of Europe and north America. Baltic Sea. Falkland Islands, *Dr. Hooker.*

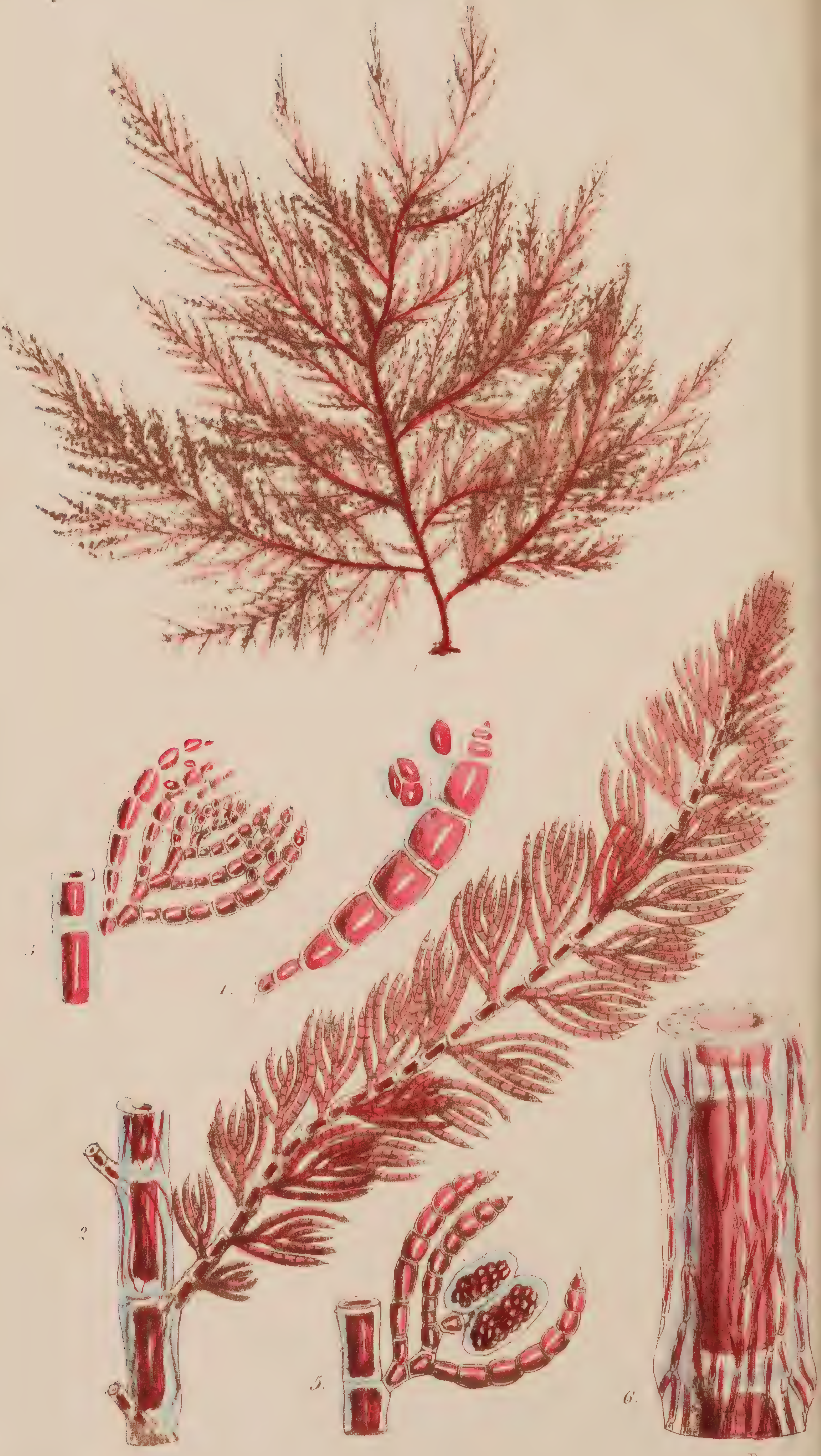
Descr. *Tufts* rising from a spongy, cushion-like base, spreading in a circle, more or less split, in a starry manner, into several minor bundles, which are either simple or divided in a fan-like or palmate manner above. *Filaments* slender, flaccid, much branched, their lower portions more or less matted together according to age, connected by irregular, root-like fibres, which issue from the lower branches, and twine among the neighbouring filaments; branches very straight, and erect, somewhat pencillate, repeatedly divided, the lesser divisions alternate, or scattered, all very straight and erect. In young specimens, and also in those of the second season, after the new growth commences, the uppermost branches are much produced, of a very vivid green colour, and distinguished by having very long joints; at a later period these disappear, and the tufts become fastigiate, and very matted together, like a sponge. *Colour* a rich, deep green, occasionally somewhat glaucous, fading and losing much of its gloss in the herbarium. *Substance*, when young, tender and flaccid, closely adhering to paper; when old, more or less membranaceous, and very imperfectly adhering to paper.

This species has a very different aspect at different periods of its growth, and it is not without a careful examination, and watching the plant as it progresses from its infant state till it reaches maturity and gradually passes off into old age and decay, that it can be fully understood. Without such examination, I should not have ventured to unite the three synonymes here brought together, which are regarded by continental authors as distinct species; and one of which, *C. centralis*, is by Kützing considered so widely separated from the others, as to be placed in a different section of the genus. The state called *centralis*, which the lower figure in our plate may be taken to represent, does indeed differ widely in aspect from the original *arcta*, described by Dillwyn, and formerly I considered it sufficiently distinct. But a more familiar acquaintance with the plant, aided by observations made at different periods of its growth, both by Mrs. Griffiths and myself, have fully convinced me that its characters entirely depend on age, and that it is merely the fully developed state of the species. *C. vaucheriæformis*, on the other hand, is the youngest stage of growth.

Cladophora arcta abounds on all our rocky shores, and appears to be equally common throughout the Northern Atlantic. Dr. Hooker also collected it in abundance at the Falkland Islands, and very probably it is distributed as abundantly in all southern latitudes with a similar climate. I believe that it always grows upon rocks, within the range of the tide, but nearly at the limit of low water, and in such places it frequently covers a considerable surface. When young, its colour is peculiarly vivid, and its aspect silky; but as it progresses, the bright colour is more and more confined to the top branches, and the lower part of the frond becomes coarse and woolly.

The species most nearly allied to *C. arcta*, are *C. uncialis*, and *C. lanosa*, both of which are of much smaller size.

Fig. 1. CLADOPHORA ARCTA; in a young state. 2. The same, later in the season:—*both of the natural size.* 3. Portion of a filament. 4. Apex. 5. Joints from the lower part of a filament:—*all more or less magnified.*



Reeve, im

PLATE CXXXVI.

CALLITHAMNION TETRAGONUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles *(favellæ)* seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from κάλλις, *beautiful*, and θαμνίον, a *little shrub*.

CALLITHAMNION *tetragonum*; outline of the frond ovate; stem cartilaginous, sub-simple, setaceous, somewhat opake, veiny, set with subquadrifarious lateral branches, furnished sometimes with a second or third series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, patent, level-topped plumules, the lowest of which are simply pinnate, the upper sub-bi-pinnate; ramuli incurved, narrowed at the base, suddenly acuminate, their articulations once and a half a long as broad, constricted at the joints; tetraspores exceedingly minute, oval, near the tips of the ramuli.

CALLITHAMNION tetragonum, *Ag. Sp. Alg.* vol. ii. p. 176. *Harv. in Hook. Br. Fl.* vol. ii. p. 343. *Harv. in Mack. Fl. Hib.* part 3. p. 215. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 90. *J. Ag. Alg. Medit.* p. 74. *Endl.* 3rd *Suppl.* p. 34.

CERAMIUM tetragonum, *Ag. Syst.* p. 137.

CONFERVA tetragona, *With.* vol. v. p. 405. *Dillw. Conf.* t. 65. *E. Bot.* t. 1690.

HAB. Parasitical on the larger Algæ; commonly on the fronds of *Laminaria digitata*. Annual. Summer. Shores of England and Ireland.

GEOGR. DISTR. Atlantic shores of Europe. Baltic and Mediterranean Seas.

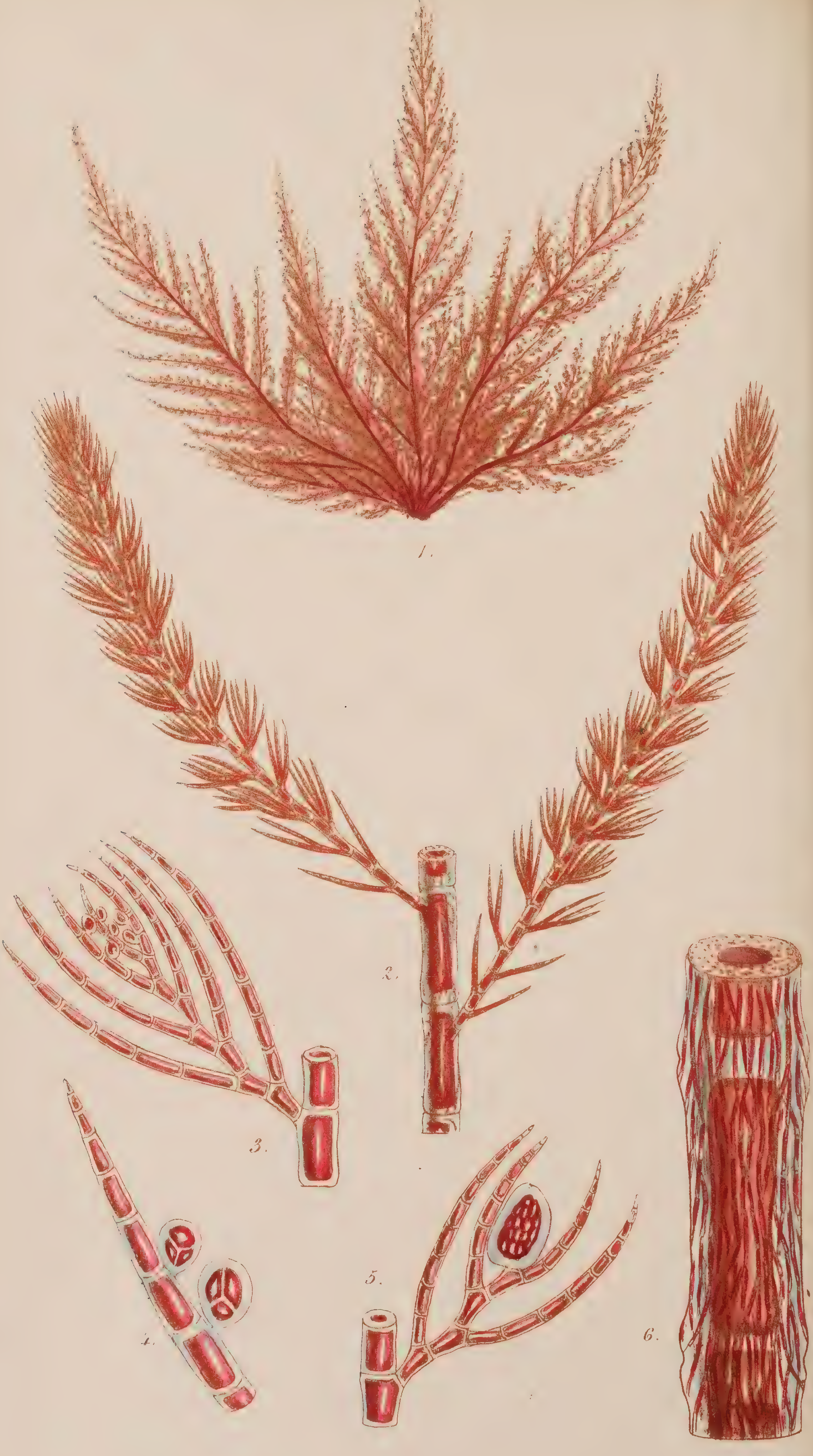
DESCR. *Root* scutate. *Fronds* from two to five inches in length, with a broadly ovate general outline. *Stems* thicker than hog's bristle, smooth, or clothed with short hair-like ramelli, jointed, but more or less opake from the veins which traverse the articulations, subsimple, furnished throughout with numerous lateral patent, alternate, subquadrifarious, simple branches, the lowermost of which are longest. These *branches* are similar to the main stem, and bear a second or third series of lesser branches, all of which are perfectly simple. The penultimate branches are about half an inch long, pellucidly jointed, and clothed with very short plumules, set alternately. *Plumules* not half a line in length, the lowermost sub-simple or pinnate, the upper gradually more compound. *Ramuli* incurved, robust, thickest in the middle, suddenly acuminated at the point. *Articulations* of the stem and branches from two to three, or rarely four times as long as broad; those of the ramuli pretty constantly once and a half as long as their breadth. *Tetraspores* very minute, oval or oblong, sometimes transversely zoned, usually tripartite, borne near the tips of the ramuli, one or two on each ramulus.

Favellæ bi-lobed, large, formed from truncated plumules. *Colour* a brownish-red, becoming orange in fresh water, and darker in drying. *Substance* between cartilaginous and membranaceous, adhering, but not very closely, to paper in drying.

Callithamnion tetragonum, when fully grown, is one of the largest and most robust and shrubby of the British species of this charming genus, and, seen under water, is an object of much beauty. In drying, though it sufficiently retains its form, it loses considerably in elegance, from the pressing together of the delicate quadrifarious ramuli, which in a state of nature stand out from the branchlets, giving to the different parts of the frond a roundness, without confusion, or matting together of the minutest part. These, in dried specimens, become confounded together. Its most frequent habitat is on the stems and margins of the laciniæ of *Laminaria digitata*, which it frequently fringes in the most beautiful manner; but it is by no means confined to this species, being often seen on some of the smaller Algæ, as on *Codium tomentosum*, *Chondrus crispus* and others. It rapidly changes colour in fresh water, assuming a brilliant orange tint, and giving out a rose-coloured powder. Though a species of large size, its *tetraspores* are exceedingly small, much smaller in proportion than those of most other species, and, being borne near the tips of the smaller and more crowded ramuli may easily escape detection. The *favellæ*, on the contrary, are of large size, and easily seen.

C. tetragonum appears to be of common occurrence on the shores of Europe, and very probably extends to the opposite side of the Atlantic. It is very closely, perhaps too closely, allied to *C. brachiatum*, Bonnem., which I have, therefore, figured on the following plate, that the distinctions may be more readily seen.

Fig. 1. CALLITHAMNION TETRAGONUM:—*the natural size.* 2. Penultimate branch, set with plumules. 3. A plumule, bearing tetraspores. 4. Ramulus from the same. 5. A plumule bearing favellæ. 6. Joints of one of the main branches, to show the veining:—*all more or less magnified.*



W.H.H. del et lith.
Reeve, im

PLATE CXXXVII.

CALLITHAMNION BRACHIATUM, *Bonnem.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; *stem* either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles *(favellæ)*, seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from κάλλις, *beautiful*, and θαμνίον, a *little shrub.*

CALLITHAMNION *brachiatum*; outline of the frond lanceolate; stem cartilaginous, subsimple, setaceous, somewhat opake, veiny, set with subquadrifarious, lateral branches, often furnished with a second series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, very erect, level-topped plumules, the lowermost of which are most simple; ramuli erect, subulate, not narrowed at base, gradually tapering to a fine point, their articulations twice as long as broad, cylindrical; tetraspores minute, oval, near the tips of the ramuli.

CALLITHAMNION brachiatum, *Bonnem.* (*sec. Lenorm. in Herb.*)

CALLITHAMNION Harveyanum, *J. Ag. in Linn.* xv. p. 45. *Endl. 3rd Suppl.* p. 34.

CALLITHAMNION granulatum, *Harv. in Br. Fl.* vol. ii. p. 334 (*not of Agardh*). *Harv. in Mack. Fl. Hib.* part 3. p. 215.

HAB. Parasitical on the larger Algæ, frequently on *Laminaria digitata, Codium tomentosum,* &c. Staffa, *Capt. Carmichael.* Orkney, *Rev. J. H. Pollexfen; Messrs. Thomas* and *M'c Bain.* Torbay and Ilfracombe, *Mrs. Griffiths.* West of Ireland, *W.H.H.* Jersey, *Miss Turner.* Probably general, but frequently confounded with *C. tetragonum.*

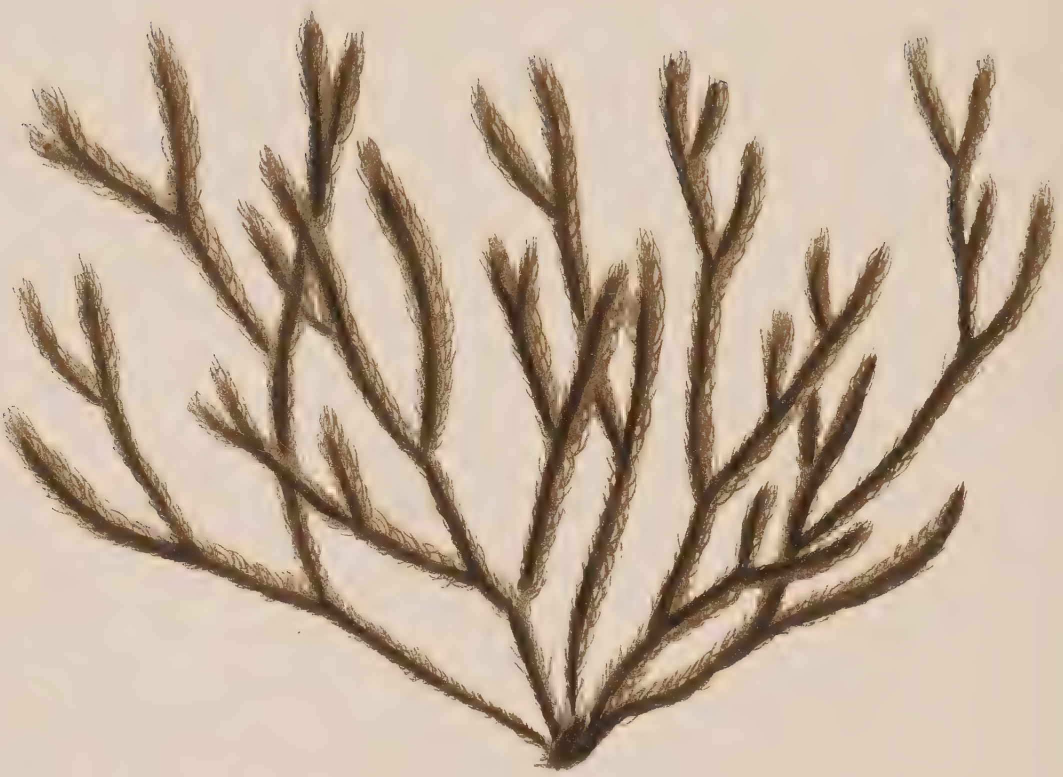
GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* scutate. *Fronds* densely tufted, from two to four inches long, with a lanceolate general outline. *Stems* simple, distinctly jointed throughout but veiny, smooth, furnished from the base with numerous closely-set, alternate, subquadrifarious, erecto-patent lateral branches, of which those toward the middle of the stem are longest, the upper ones gradually decreasing. These are commonly simple, but in larger specimens bear a second series of lesser branches. Penultimate branches from a quarter to half an inch long, erecto-patent, subquadrifarious, set with alternate, very erect plumules in their upper part, below with simple or once forked subulate ramuli; plumules subsimply pinnate, level-topped, their pinnules very erect, subulate, not narrowed at base, perfectly cylindrical and gradually tapering to a fine point, somewhat incurved. *Tetraspores* small, elliptical, borne on the uppermost pinnules, near their tips. *Favellæ* simple. or bilobed, at the apices of shortened plumules. *Articulations* of the main stem from twice to thrice or four times as long as broad; of the ramuli about twice as long as broad. *Colour* a brownish-red, purplish when dry. *Substance* between cartilaginous and membanaceous, adhering to paper.

I here figure a plant which in the 'British Flora' I had incorrectly referred to *C. granulatum*, Ag., a species which I now know to be much more nearly allied to our *C. spongiosum*. In the 'Manual', I have been content to regard the present as merely a slender variety of *C. tetragonum*, with which it is very commonly confounded, and which it resembles in most of its essential characters, and in general aspect can hardly be distinguished, except on a close inspection. My friend Professor J. Agardh, however, has judged differently, and done me the honor of giving it my name, in which he has been followed by Endlicher, in his useful Synopsis. My attention is thus again directed to the subject, and I have deemed it best to give a figure in which all the characters by which it differs from *C. tetragonum* being depicted, botanists may form their own opinion as to the validity of its claims to rank as a species. I should have adopted the specific name of Agardh, had I not received from M. Lenormand specimens, exactly similar to our British ones, bearing a name conferred by Bonnemaison, which, I believe, has priority to that proposed by Agardh, though at present I am not aware where it has been published.

The character by which *C. brachiatum* appears *essentially* to differ from *C. tetragonum*, is to be found in the ultimate ramuli, which in this are constantly subulate, gradually tapering from the base to the apex; and in that are suddenly acuminate, or, as it were, *mucronate*. This is what originally induced me to admit the species, which I found indicated in the unpublished 'Algæ Appinenses' of Carmichael, under the name *C. fruticulosum*; and so far as my observations have gone, this character appears to be constant. Minor and less important distinctions may be taken from the length of the joints, and their *form*, which is cylindrical in the present species and oval in *C. tetragonum*. Both plants are equally common, and found in the same situations.

Fig. 1. CALLITHAMNION BRACHIATUM :—*of the natural size*. 2. Penultimate branches. 3. A plumule, bearing tetraspores. 4. Apex of a fertile pinnule. 5. A plumule bearing a favella. 6. Joint of a main branch or of the stem :—*all magnified*.



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2.

5.

3.

Plate CXXXVIII.

CLADOSTEPHUS SPONGIOSUS, *Ag.*

Gen. Char. *Fronds* inarticulate, rigid, cellular, whorled with short, jointed, subsimple ramuli. *Fructification*; ellipticle utricles, furnished with a limbus, pedicellate, borne on accessory ramuli. Cladostephus (*Ag.*),—κλαδος, a *branch,* and στεφος, a *crown.*

Cladostephus *spongiosus*; branches thick and clumsy; ramuli mostly simple, sometimes forked, irregularly whorled and densely imbricated.

Cladostephus spongiosus, *Ag. Syst.* p. 168. *Ag. Sp. Alg.* vol. ii. p. 12. *Harv. in Hook. Br. Fl.* vol. ii. 322. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 36. *Wyatt, Alg. Danm.* no. 169. *J. Ag. Alg. Medit.* p. 30. *Endl. 3rd Suppl.* p. 24.

Cladostephus laxus, *Fl. Dan.* t. 1955. f. 3. (?) *excl. syn.*

Conferva spongiosa, *Huds. Fl. Ang.* p. 596. *Lightf. Fl. Scot.* p. 983. *With.* vol. iv. p. 132. *Dillw. Conf.* t. 42. *E. Bot.* t. 2427. fig. 1.

Fucus hirsutus, *Linn. Mant.* p. 134. *Esper*, t. 28.

Hab. On rocks and stones in the sea, between tide marks, and at a greater depth. Perennial. Winter. Common on the shores of the British Islands.

Geogr. Distr. Atlantic shores of Europe and North America. Mediterranean Sea. Cape Horn, *Dr. Hooker.*

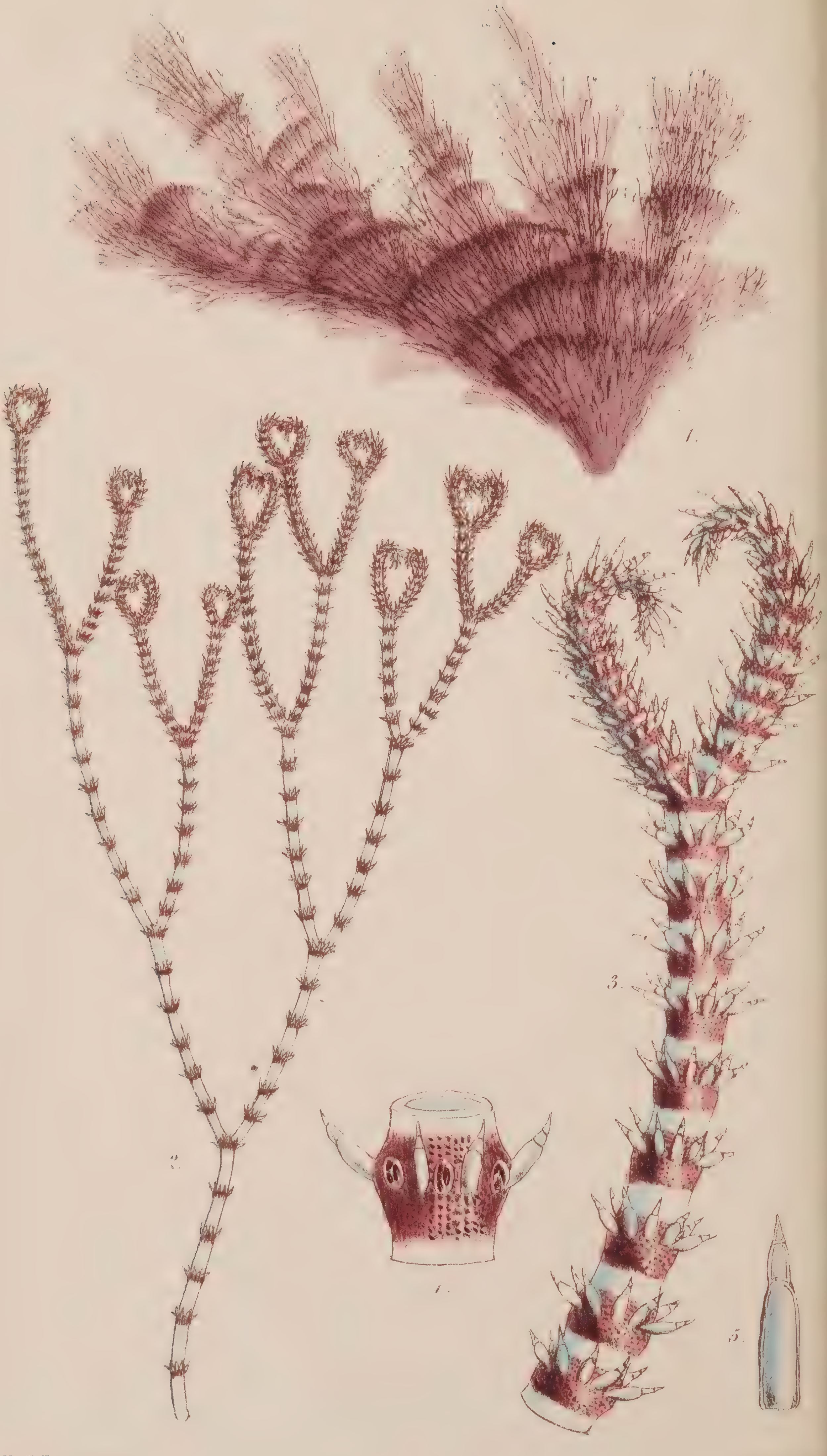
Descr. *Root* discoid. *Fronds* from three to four inches high, thicker than bristle, irregularly branched, or somewhat dichotomous, the branches flexuous, patent, thickened here and there, more or less divided, and densely clothed throughout with short jointed setaceous ramelli. *Ramelli* from half a line to a line in length, incurved, simple, or with a forked point, attenuated at the base, acute, densely crowded together in very close whorls. These ramelli are more or less deciduous in winter, at which season the frond is covered with others of less size, straighter, and perfectly obtuse, which produce the fructification. This consists of stalked, elliptical utricles, or spores, disposed along the sides of the ramelli, and either opposite to each other or irregularly scattered. Joints of the ramelli shorter than broad, dotted, composed of several layers of minute cells. *Colour* dull brown, or dirty olive green. *Substance* of the stem woody. It does not in the least adhere to paper in drying.

* * *

Cladostephus spongiosus, the earliest described species of the genus, differs from *C. verticillatus,* already figured at Pl. XXXIII., of our first volume, more by its smaller size, more clumsy and somewhat flexuous branches, and more closely imbricated ramelli, than by any more definite character. The distinction in the ramelli, noticed in the specific phrase by most authors, is not constant, for these are often forked in the present species, though more usually simple. The colour is darker than that of *C. verticillatus*, and, on the whole, the present is a much less elegant plant. The accessory ramelli, which constitute the *Sphacelaria Bertiana* of Italian writers, are found on this species equally as on *C. verticillatus*. The figure of Dillwyn which represents ovate capsules, discharging spores through a terminal pore, appears to be incorrect; at least, I have never seen anything similar in the multitudes of specimens which have passed through my hands.

C. spongiosus is a very common plant throughout the northern Atlantic, growing on rocks and stones between tide marks, and is also found in the Baltic and Mediterranean Seas. Dr. Hooker collected specimens at Hermite Island, Cape Horn, which offer no character by which they can be distinguished from individuals of British growth.

Fig. 1. CLADOSTEPHUS SPONGIOSUS:—*of the natural size.* 2. Apex of one of the branches. 3. Ramelli. 4. Fertile ramelli, produced in winter. 5. Spore or utricle, *in situ*:—*all more or less magnified.*



W H H del

PLATE CXXXIX.

CERAMIUM CILIATUM, *Ducluz.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*),—from κεραμος, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *ciliatum*; frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, with or without lateral branchlets, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem from three to four times longer than broad, the upper gradually shorter; dissepiments coloured, furnished with a whorl of robust, subulate, three-jointed prickles; tetraspores alternating with the prickles; favellæ subtended by two or three ramuli.

CERAMIUM ciliatum, *Ducluz. Ess.* p. 64. *Lyngb. Hyd. Dan.* p. 121. t. 37. *Ag. Sp. Alg.* vol. ii. p. 153. *Hook. Fl. Scot.* part 2. p. 14. *Grev. Fl. Edin.* p. 311. *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Harv. in Mack. Fl. Hib.* part 3. p. 211. *Harv. Man.* p. 100. *Wyatt, Alg. Danm.* no. 180. *J. Ag. Alg. Medit.* p. 81. *J. Ag. Advers.* p. 26. *Mont. Fl. Algier.* p. 145.

CERAMIUM diaphanum, var. ciliatum, *Duby, Bot. Gall.* p. 967. *Ag. Syst.* p. 134.

ECHINOCERAS ciliatum, *Kütz. in Linn.* vol. xv. p. 736. *Kütz. Phyc. Gen.* p. 380.

BORYNA ciliata, *Gratel. Bory, Dict. Class. Fl. Pelop.* p. 77.

CONFERVA ciliata, *Ellis, Phil. Trans.* vol. lvii. p. 425. t. 18. fig. *h. H.* *Huds. Fl. Ang.* p. 599. *Lightf. Fl. Scot.* p. 998. *With. Br. Pl.* vol. iv. p. 137. *Dillw. Conf.* p. 77. t. 53. *E. Bot.* t. 2428.

CONFERVA pilosa, *Roth. Cat. Bot.* vol. ii. p. 225. t. 5. f. 2.

HAB. On rocks and stones in the sea, either in tide pools or exposed at low water; also attached to Corallines and other Algæ. Annual. Summer. Not uncommon on the British shores, from Orkney to Cornwall.

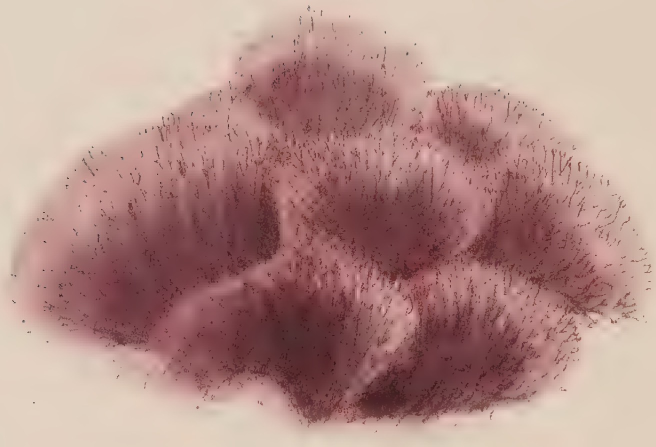
GEOGR. DISTR. Dispersed throughout the Atlantic and Pacific Oceans, in temperate latitudes of the northern and southern hemisphere.

DESCR. *Fronds* forming dense tufts, from three to six inches in diameter, as fine as human hair, nearly of equal diameter throughout, rigid, harsh and rather brittle, repeatedly dichotomous, occasionally furnished with lateral dichotomous branchlets, fastigiate; the *apices* strongly hooked inwards; *axils* rather patent. *Articulations* colourless, those of the lower parts of the filaments several times longer than broad, of the upper branches gradually shorter, and the uppermost joints extremely short. *Dissepiments* coated with a broad, coloured band of minute cellules, more or less clearly defined, furnished with a regular whorl of robust, subulate, colourless prickles, composed of three cells or joints, the lowest joint being twice as long as the other two; the uppermost very small and acute. *Tetraspores* not very prominent, disposed in a whorl round the joint, alternately with the prickles. *Favellæ*, according to Dillwyn, "roundish, lateral, nearly sessile, and mostly accompanied by three or four, short, incurved ramuli". *Colour* of the tufts a purplish-red. *Substance* membranaceous and rigid, imperfectly adhering to paper in drying.

Under the common name *ciliatum* at least three distinct varities of *Ceramium*, now regarded as distinct species, have hitherto been confounded by British botanists. These I have brought together in the present number for the purpose of contrasting their characters. The excellent figures published by Ellis, and Dillwyn, and the descriptions given by those authors, leave us at no loss to decide to which of the three modern species their synonyme belongs. They appear to have had the present species solely in view. In Herbaria, on the contrary, the three are very frequently confounded together, and even in the excellent work of Mrs. Wyatt, specimens of *C. echionotum* are published in some of the copies, as *C. ciliatum*.

It is but just to state that my accurate friend Mrs. Griffiths has for many years been convinced of the distinctness of these plants and separated them in her own rich collection; and one of them was also well distinguished by the late Capt. Carmichael. To the naked eye they have very much the same appearance, and to the touch the same peculiarly harsh feel, and it is not till we submit small portions to the test of the microscope that their differences are perceived. Obvious differences may then be observed in the spines, with which the joints are armed, and these appear to be constant.

Fig. 1. Ceramium ciliatum; tuft, *of the natural size*. 2. Portion of a filament. 3. Apex of the same. 4. A joint with tetraspores. 5. A prickle:—*all more or less highly magnified.*



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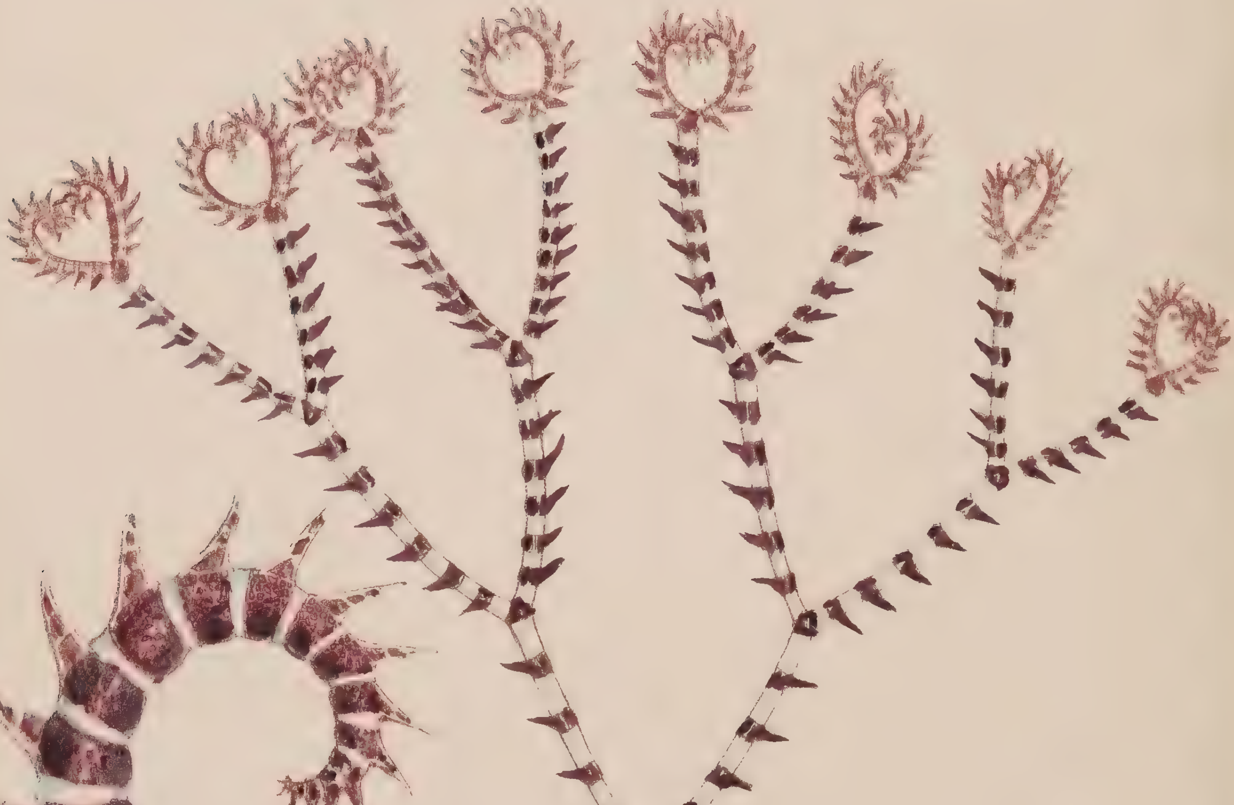

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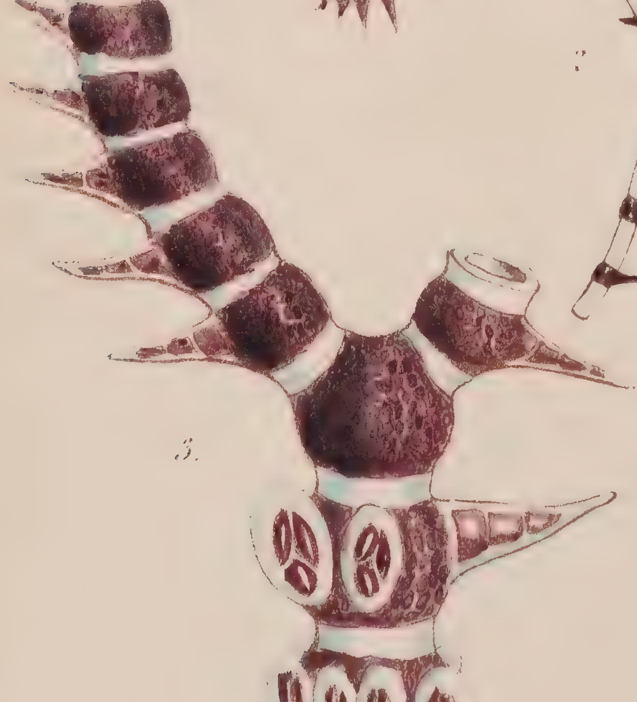

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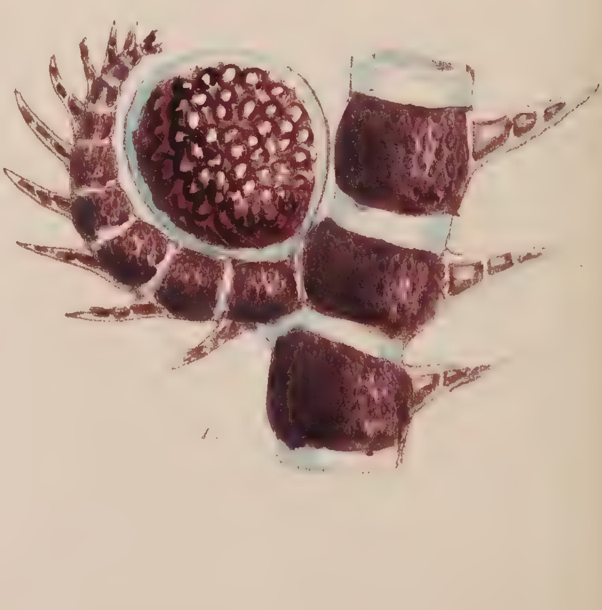

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PLATE CXL.

CERAMIUM ACANTHONOTUM, *Carm.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from κεραμος, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *acanthonotum;* frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem several times longer than broad, the upper gradually shorter; dissepiments coloured, armed on the outer edge with a single robust, broadly subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ roundish, subtended by a solitary, incurved ramulus.

CERAMIUM acanthonotum, *Carm. Alg. Appin. ined. cum ic. J. Ag. Advers.* p. 26.

CERAMIUM ciliatum, β. acanthonotum, *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Harv. Man.* p. 100.

ACANTHOCERAS Shuttleworthianum, *Kütz. in Linn.* t. 15. p. 739. *Kütz. Phyc. Gen.* p. 381. t. 46. f. 4.

HAB. On exposed rocks, near low-water mark, and on the smaller Algæ. Annual. Summer and autumn. Not uncommon. Appin, *Capt. Carmichael.* Aberdeen, *Dr. Dickie.* Torbay, *Mrs. Griffiths,* Plymouth, *Messrs. Hore and Rohloff.* Common in the west of Ireland, *W.H.H.* Youghal, *Miss Ball.*

GEOGR. DISTR. The British Islands.

DESCR. *Fronds* very densely tufted, when old forming intricate and often matted bunches, from two to six inches in diameter, slender, about as thick as human hair, of equal diameter throughout, excessively divided dichotomously and more or less furnished with lateral dichotomous branchlets; in old specimens these latter become in their turn repeatedly divided, and, issuing along the whole of the lower parts of the frond, serve to render the tufts so compact and closely matted, as they eventually become. *Axils* patent in all parts of the frond; *apices* strongly rolled inwards. *Articulations* colourless, cylindrical, those of the lower parts of the stem several times longer than broad; the upper gradually shorter, and the ultimate ones extremely short, many times shorter than broad. *Dissepiments* coated with a broad, deeply coloured, well-defined band of minute, angular cellules; each with a solitary, robust, coloured, three-jointed, broadly subulate, or deltoid, very acute prickle on its outer margin. *Tetraspores* very large, with broad pellucid pericarps, erumpent from the joint, whorled. *Favellæ* globose, lateral, subtended by a single, strongly incurved ramulus. *Colour* of the tufts dark purple. *Substance* rigid, imperfetly adhering to paper.

Ceramium acanthonotum was first distinguished by the late Capt. Carmichael, of Appin, in whose unpublished 'Algæ Appinenses' an excellent description and accurate figure are given. It is my fault that in the 'British Flora', and subsequent works, it appears only in the rank of a variety. Later observations, on several of our shores, and comparison of numerous specimens, from various quarters, have long since convinced me that it is a true species. Its colour is much darker than that of *C. ciliatum*, often an intense purple; and the tufts are usually shorter, and more densely compacted. These characters, however, are not sufficiently definite, and an appeal to the microscope may be necessary. This at once displays the admirable character by which the species may be recognized, namely, the *solitary*, three-jointed spine, arming the outer margin of every joint. The only other known British *Ceramium* which has a spine at all similar, is *C. flabelligerum*, but that is at once distinguished by its joints being coloured, not hyaline; not to speak of its very different branching, and the smallness of its spine.

Kützing, in his revision of the genus *Ceramium*, divides the species into six distinct genera, one of which he founds on the present individual, which he distinguishes generically from other ciliated *Ceramia* because its tetraspores are erumpent. As some of my readers may desire to know the *characters* attributed to this author's genera, they are here given.

HORMOCERAS. Frond jointed; cortical cells collected at the dissepiments in transverse zones; tetraspores immersed. (*C. diaphanum and its allies; thirteen species enumerated.*)

GONGROCERAS. Frond jointed; cortical cells collected at the dissepiments in transverse zones; tetraspores erumpent. (*C. Deslongchampsii, and five others.*)

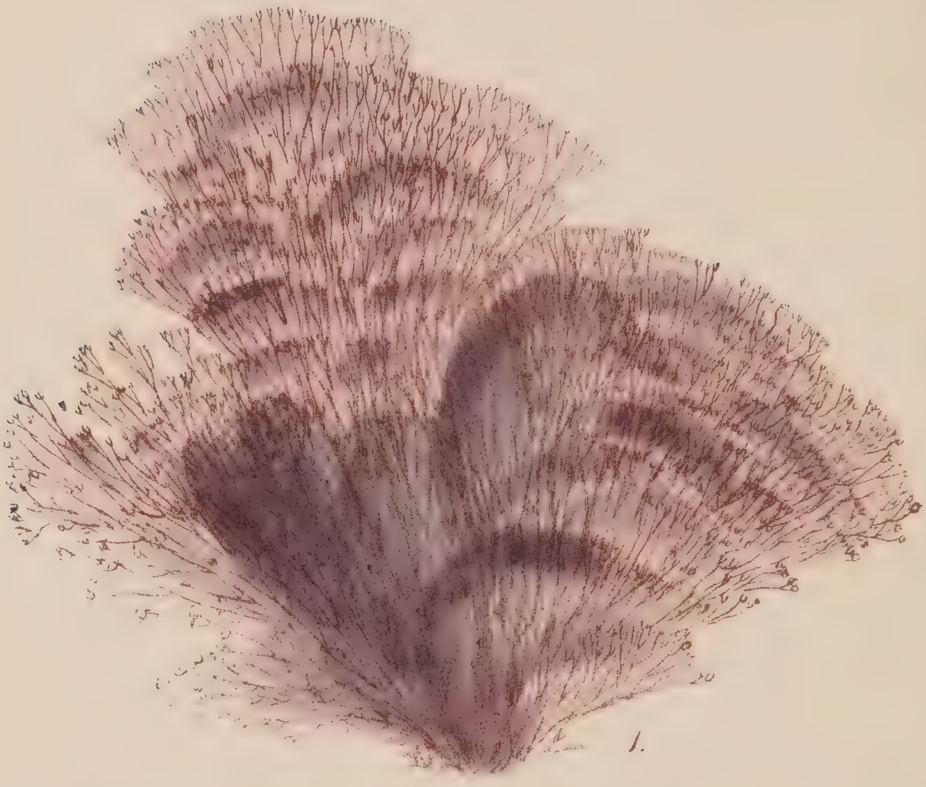
ECHINOCERAS. Frond jointed, zoned and aculeated at the joints; tetraspores immersed. (*C. ciliatum, and nine others.*)

ACANTHOCERAS. Frond jointed, zoned and aculeated at the joints; tetraspores erumpent. (*C. acanthonotum.*)

CERAMIUM. *Frond* filiform, consisting of a jointed central axis, and a cortical, continuous layer of cells, destitute of cilia or spines; tetraspores immersed in the cortical layer. (*C. rubrum., &c.*)

CENTROCERAS. Frond as in *Ceramium*, but furnished at the joints with prickles or spikes; tetraspores erumpent. (*C. clavulatum, and five others.*)

Fig. 1. CERAMIUM ACANTHONOTUM :—*tuft of the natural size.* 2. Portion of a filament. 3. Small part of the same, with *tetraspores.* 3. Small portion of a filament, with a *favella, in situ* :—*all more or less magnified.*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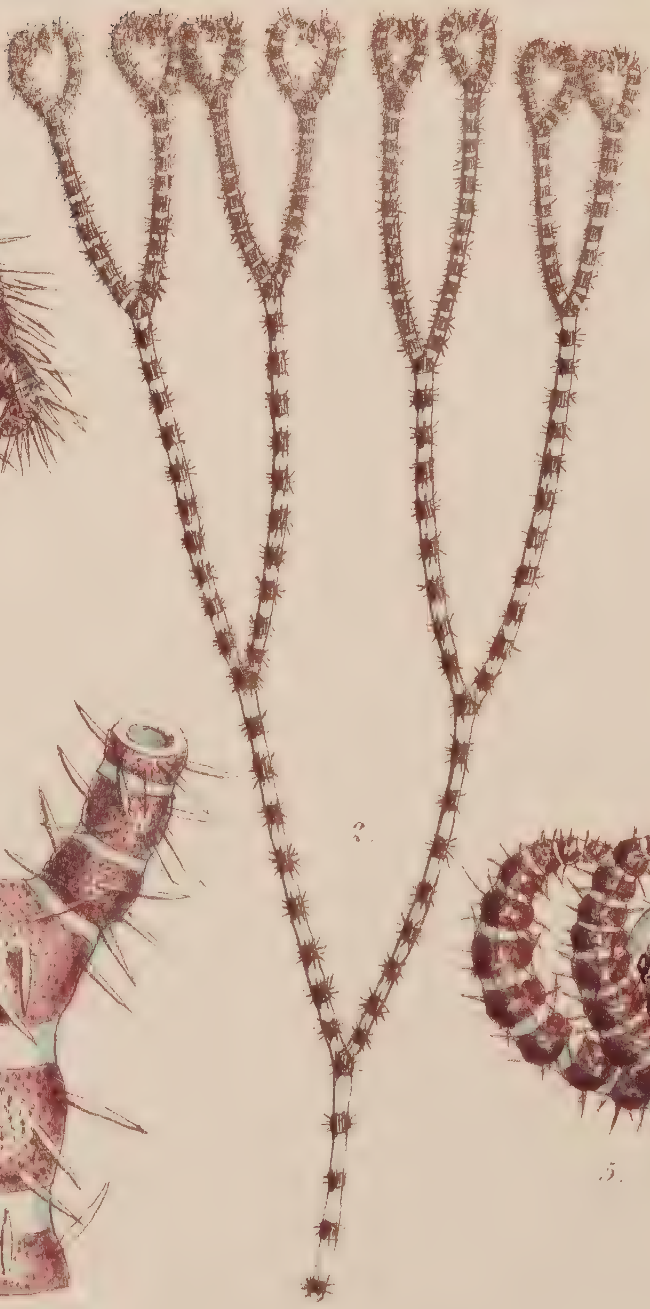
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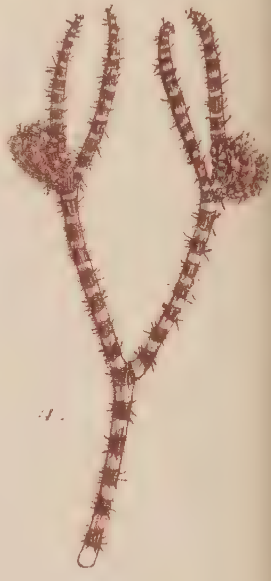
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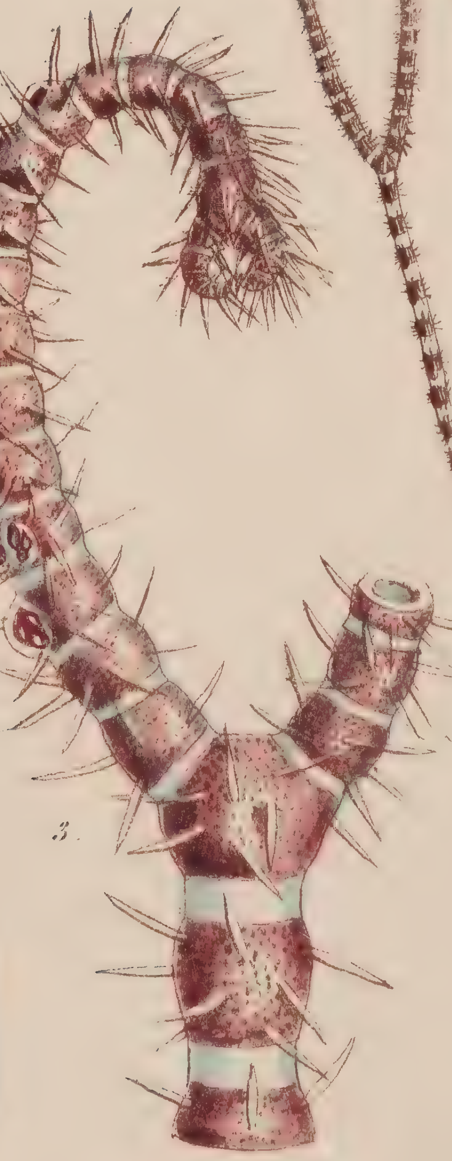
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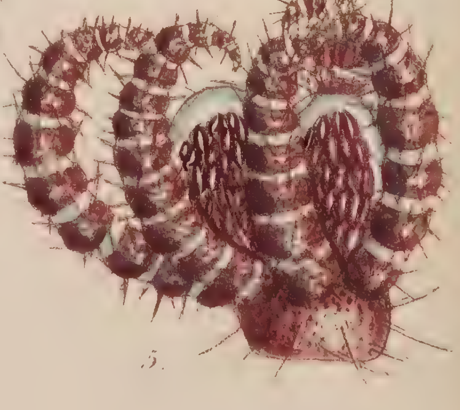
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W.H.H. del et lith

Reeve, imp

PLATE CXLI.

CERAMIUM ECHIONOTUM, *J. Ag.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*)—from κεραμος, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *echionotum*; frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, frequently with lateral forked branchlets, fastigiate, the apices more or less involute; articulations pellucid, those of the middle of the stem three or four times longer than broad, the upper gradually shorter, the uppermost extremely short; dissepiments coloured, armed with numerous, slender, irregularly inserted, subulate, colourless, one-jointed prickles; tetraspores mostly solitary in each joint, erumpent, along the outer margin of the filament; favellæ mostly bilobed, lateral, subtended by numerous, strongly incurved ramuli.

CERAMIUM echionotum. *J. Ag. Advers.* p. 27.

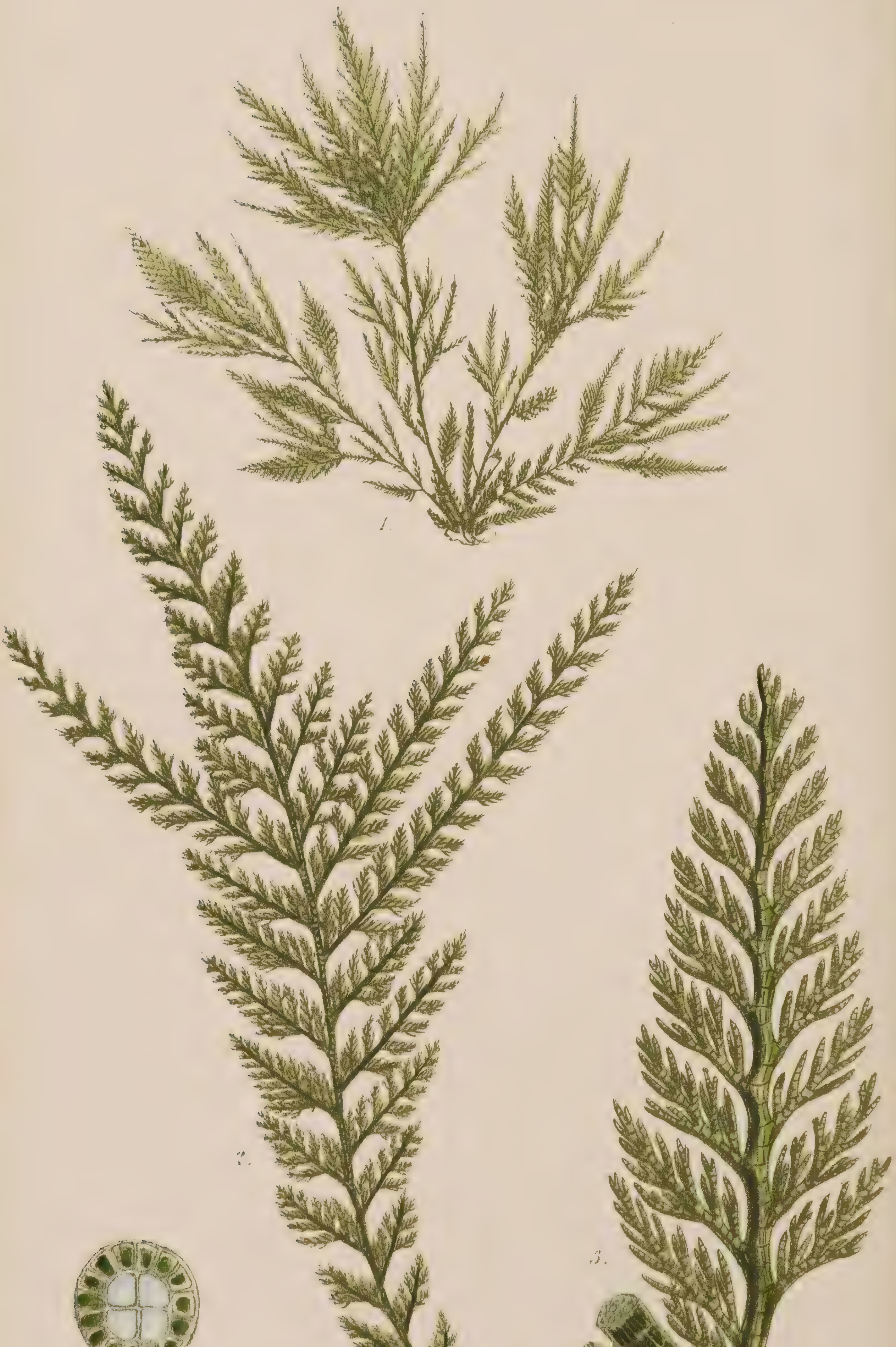
HAB. On rocks and stones, between tide marks; and in tidal pools parasitic on various Algæ. Annual. Summer and autumn. Common in several places. Torbay *Mrs. Griffiths.* Plymouth, *Messrs. Hore* and *Rohloff.* Youghal, *Miss Ball.* North of Ireland, *Mr. W. Thompson.* West of Ireland, *W.H.H.*

GEOGR. DISTR. Coasts of Europe, both Atlantic and Mediterranean.

DESCR. *Fronds* capillary, densely tufted, three to six inches long, harsh and rigid to the touch, of nearly equal diameter throughout or slightly attenuated upwards, many times dichotomous, frequently furnished with lateral, repeatedly forked, short branchlets, fastigiate. *Axils* patent in all parts of the frond. *Apices* more or less strongly hooked inwards. *Articulations* at first filled with a pale pink fluid, at length colourless, cylindrical, those of the lower part of the frond several times longer than broad, the upper gradually shorter. *Dissepiments* coated with a broad, clearly defined band of minute coloured cellules, armed with more or less numerous, irregularly inserted, slender, brittle, acicular, colourless, one-jointed prickles. *Tetraspores* confined to the outer edge of the filament, one, or rarely two, in each dissepiment, prominent, with wide pericarps. *Favellæ* generally near the apices of the frond, or of the lateral ramuli, often placed in the fork, and subtended by an involucre formed of several, involute ramuli. *Colour* of the tufts, a more or less deep purplish-red. *Substance* rigid, imperfectly adhering to paper.

Mrs. Griffiths has for many years regarded the plant here figured, as being distinct from *C. ciliatum*, from which the nature and disposition of the prickles that clothe the joints in greater or less number at once distinguish it. In *C. ciliatum* there is a regular whorl of stout three-jointed prickles, all pointing upwards, round the centre of every joint; here we have several slender, one-jointed, needle-shaped prickles scattered irregularly and pointing in various directions like the spines of a sea-urchin, a resemblance which appears to have suggested the specific name under which Professor Agardh has described it. In young specimens the joints, at least the upper ones, are filled with a purplish fluid which makes the frond, while living, appear to be fully coloured, not diaphanous; when dried this fluid is dispersed and the true nature of the joint is obvious. Specimens from different quarters differ in some minor points, and possibly more than one species may still be confounded under this name, but the subject is one of great difficulty, and requires considerable observation of the living plant, during its whole course of growth.

Fig. 1. Ceramium echionotum; a tuft, *of the natural size*. 2. Upper portion of a filament. 3. Apex, with tetraspores *in situ*. 4. Portion of a filament with involucres. 5. Involucre containing a bilobed *favella*. 6. A prickle.



W. H. H. del. et lith.   Reeve, imp.

PLATE CXLII.

SPHACELARIA FILICINA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. —SPHACELARIA (*Lyngb.*), σφάκελος, *gangrene,* alluding to the withered tips of the branches.

SPHACELARIA *filicina*; frond shaggy at the base, slender, irregularly branched; branches lanceolate, erecto-patent, bi-tri-pinnate; pinnæ alternate, erect; pinnules multifid, lanceolate; axils all very acute and narrow.

SPHACELARIA filicina, *Ag. Syst.* p. 166. *Ag. Sp. Alg.* vol. ii. p. 22. *Harv. in Hook. Br. Fl.* vol. ii. p. 323. *Mont. Crypt. Alg.* no. 24. *Menegh. Alg. Ital. et Dalm.* p. 324. *Harv. Man.* p. 37. *J. Ag. Alg. Medit.* p. 30. *Endl. 3rd. Suppl.* p. 23. *Mont. Fl. Alg.* p. 41. *Wyatt, Alg. Danm.* n. 170.

SPHACELARIA hypnoides, *Grev. Scott. Crypt. Fl.* t. 348.

SPHACELARIA simpliciuscula, *Ag. Sp. Alg.* vol. ii. p. 31.

HALOPTERIS filicina, *Kütz. Phyc. Gen.* p. 292.

CERAMIUM filicinum, *Gratel. Journ. Med.* vol. iv. p. 33.

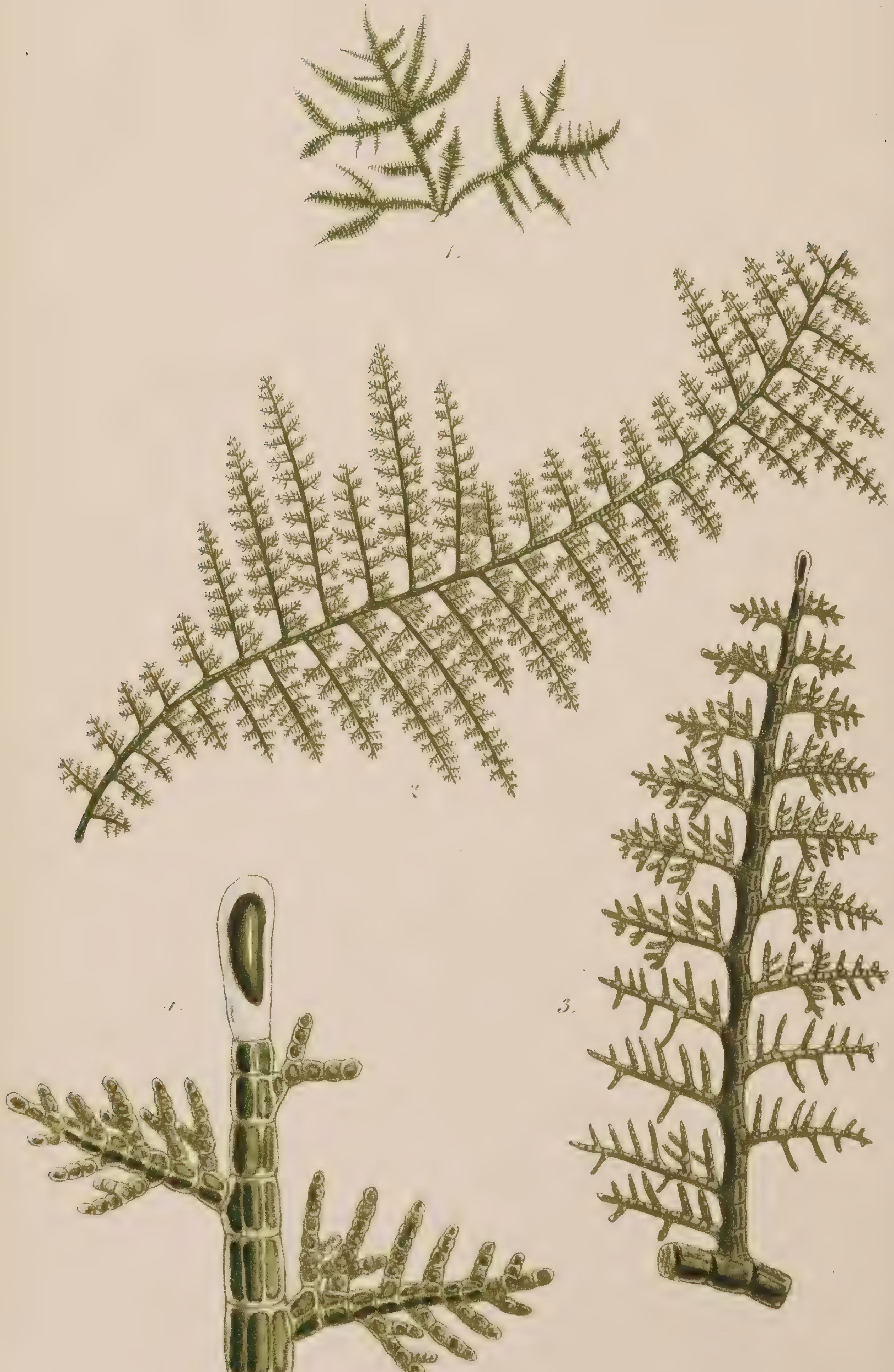
HAB. On rocks and nullipores near low-water mark, and at the roots of *Laminaria,* &c. Very rare. Perennial. Fruiting in Winter. Plymouth, *Mr. Sconce.* Ilfracombe, *Mrs. Griffiths* and *Mrs. Hare.* Salcombe, *Mrs. Wyatt.* Jersey, *Miss Turner* and *Miss White.* Mount's Bay, Cornwall; and Holyhead, Anglesea, *Mr. Ralfs.* Belfast Bay, *Mr. W. Thompson.* Youghal, *Miss Ball.* Kinsale Harbour, *Dr. J. R. Harvey.*

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea.

DESCR. *Fronds* two to four inches high, slender, more or less clothed at the base with curled brown fibres, irregularly and sparingly divided; branches distichous, erect, often bearing at their summit numerous lesser branches displayed like a fan; sometimes naked, sometimes regularly pinnated throughout. *Branches* linear-lanceolate in outline, the uppermost and lowermost pinnæ generally shorter, those in the middle longer, with now and then two or three of much greater length than those immediately adjoining. *Pinnæ* alternate, erecto-patent, bi-pinnate, or tri-pinnate below, with two pinnules constantly given off from the upper side of the rachis before any issue from the lower side. *Pinnules* issuing at every second joint, very erect, at first simple and subulate, afterwards pinnato-multifid, their ultimate divisions subulate and appressed. *Fructification* produced on the young pinnules while yet simple, a single obovate *spore* forming in the axil of the pinnule. *Articulations* half as long as broad, multi-striate; the striæ less evident in the younger parts of the frond. A cross section of the stem shows four large central cells, destitute of endochrome, surrounded by numerous, coloured cellules. *Colour* a more or less greenish olive. *Substance* rigid, scarcely adhering to paper.

There are few more beautiful plants among the filiform Algæ of our coasts, and not many more rare than the subject of this plate, which, though found in several distant localities is no where abundant in Britain. It is, indeed, a species of the south of Europe which finds its northern limit in our seas, where it does not reach much more than half the size that it attains in the Mediterranean. Specimens from the shores of Italy are nearly as large and bushy as *S. scoparia*, but much more slender in all their parts. Our British individuals, except those from Jersey, are so feeble, and have so different an aspect, that Dr. Greville, who first figured them in his beautiful Cryptogamic Flora, regards them as belonging to a different and peculiar species, which he calls *S. hypnoides*. A careful comparison with numerous continental specimens from various quarters has led me to an opposite conclusion, the differences appearing to me to be merely such as may be fairly referred to climate. The Mediterranean specimens of *Grateloupia filicina* are quite as unlike the British ones as those of the Mediterranean *Sphacelaria filicina* are to ours. There is no difference in the microscopic characters of the ramuli, or in their disposition, if the specimens have respectively been collected at the same season. Between the winter and summer states of this species, however, the differences are so great, that Agardh formerly constituted them two species, his *S. simpliciuscula*, which has its pinnules subsimple, being the winter state of *S. filicina*. A similar difference between the summer and winter appearance of *S. scoparia* has already been pointed out. Indeed, so great is the variableness of aspect which specimens at different ages present, among the *Sphacelariæ*, that, as Meneghini well remarks, the greatest caution should be exercised by authors who propose new species; and the plants should be watched in their place of growth from their first appearance to maturity. But this is often no easy matter, especially with such rare plants as the present. Since our plate has been prepared Miss Turner has communicated from Jersey a magnificent specimen, fully as large as one from the south of Europe, and covered with fructification. I regret that it is too late to add a representation of the spore to the analysis already given.

Fig. 1. SPHACELARIA FILICINA:—*the natural size*. 2. A branch. 3. A pinna. 4. Cross section of the stem.



W. H. H. del. et lith.

Reeve, imp.

PLATE CXLIII.

SPHACELARIA SERTULARIA, *Bonnem.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφεκαλος, *gangrene,* alluding to the withered tips of the branches.

SPHACELARIA *Sertularia*; frond slightly shaggy at the base, weak and slender, irregularly branched; branches somewhat lanceolate or linear horizontally patent, tripinnate; pinnæ alternate, divaricate; pinnules very patent, multifid; axils all very obtuse and wide.

SPHACELARIA Sertularia, *Bonnem. sec. Lenorm. in Herb.*

SPHACELARIA filicina β. patens, *Harv. Man.* p. 37.

HAB. Parasitical on various Algæ, in from four to fifteen fathoms water. Very rare. Perennial. Brighton Beach, *Mr. Borrer.* Torbay, and other places on the South Coast, *Mrs. Griffiths.* Isle of Wight, *Miss Kirkpatrick.* Jersey, *Miss H. M. White.* Carrickfergus, *Mr. M'Calla.* Roundstone Bay, *W.H.H.*

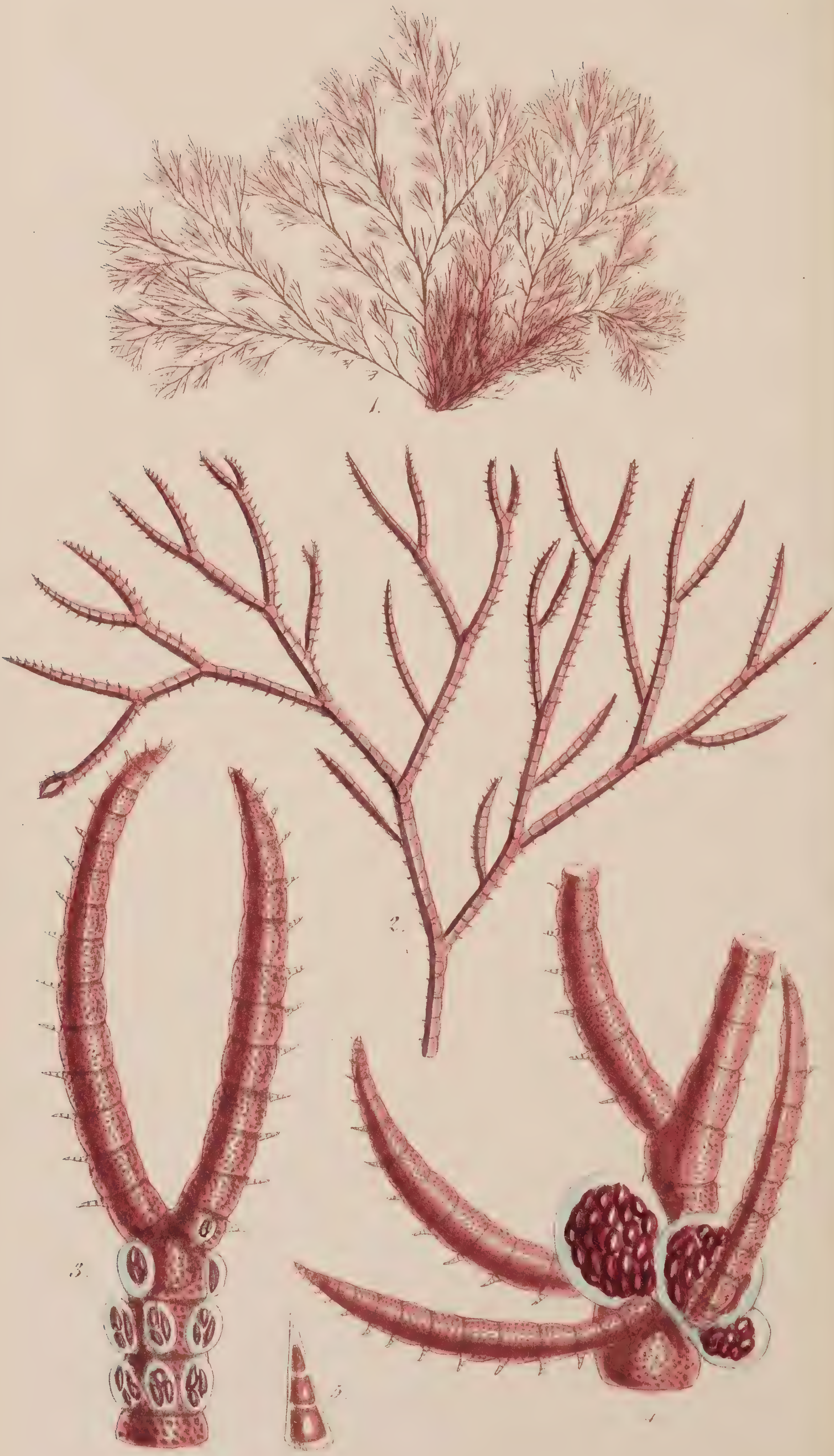
GEOGR. DISTR. Atlantic shores of France, South of England, and Ireland.

DESCR. *Fronds* about an inch, rarely two inches high, very slender, growing in irregular, somewhat matted patches or tufts, among the branches of other Algæ, more or less connected at base by curled brown fibres, more or less regularly pinnate, or somewhat naked below and producing at the apex numerous branches spreading like a fan. *Branches* linear, linear-lanceolate, or oblong, closely tripinnate throughout, the pinnæ very unequal in length, long and short ones sometimes alternating; at other times most of the central pinnæ are of equal length, those near the top and bottom being much shorter. *Pinnæ* horizontally patent, alternate, bipinnate below, more or less tripinnate above, the two lowermost pinnæ given off from the upper side of the rachis before any issue from the lower. *Pinnules* issuing at every second joint, horizontally patent or divaricate, pinnato-multifid, their ultimate divisions linear, obtuse, patent. *Articulations* about as long as broad, 3–4-striate, the striæ less numerous in the younger parts; the ultimate ramuli mono-siphonous. *Colour* an olive-green. *Substance* rigid, scarcely adhering to paper. The apices of the branches are frequently much produced, sphacelate, containing a dark coloured granular mass.

It is, I allow, with some hesitation that I offer a figure of the present plant as anything more than a deep-water variety of *Sphacelaria filicina*, analogous to somewhat similar varieties of several other Algæ, individuals of which, when growing at a more than ordinary depth differ as much from their normal state, and in a very similiar manner, as the present does from *S. filicina.* Persons accustomed to dredging must be familiar with states of *Plocamium coccineum, Dasya coccinea,* &c., which are more slender than the normal form, irregularly branched, with very patent branches and ramuli, and which are usually found entangled with other Algæ, to which they are attached by hooked processes, different from their true roots. The plant here figured has always appeared to me to be a simliar state of *S. filicina,* nor am I yet convinced that it ought to be regarded as any thing more. Other observers are, however, of a different opinion, and among them Mrs. Griffiths, who has repeatedly gathered both plants, and considers the constantly parasitic habit of the *S. Sertularia,* its small size, and very patent branching, to afford sufficient distinctions. In the plate here given I have taken pains to represent all these characters in sufficient detail to be readily contrasted with *S. filicina* figured in the last plate, and having done so I must submit the decision to the judgment of my fellow students. At any rate there are quite differences enough to constitute an excellent "*cabinet species*".

I am not aware in what work Bonnemaison has published this plant. My knowledge of his synonyme is due to M. Lenormand who has obligingly communicated a specimen from the north of France under the name here adopted, and who informs me that it is frequently cast on the French coast entangled with the uncinate variety of *Plocamium coccineum.*

Fig. 1. SPHACELARIA SERTULARIA; *of the natural size.* 2. A branch. 3. A pinna. 4. Apex of a pinna, with some of the smaller pinnules.



W. H. H. del. et lith

Reeve, imp.

PLATE CXLIV.

CERAMIUM FLABELLIGERUM, *J. Ag.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores,* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli.—CERAMIUM (*Roth*), from κεραμος, a *pitcher,* but the fruit is not pitcher-shaped.

CERAMIUM *flabelligerum*; frond subsetaceous, attenuated upwards, rigid, flabellately branched, irregularly dichotomous, with lateral forked ramuli, the apices acute, patent or somewhat incurved; articulations coated with coloured cellules, those of the lower branches about twice as long as broad, of the upper equal in length and breadth, each armed on the outer edge with a single, minute, subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ two- or three-lobed, berry-like, subtended by several patent, subulate ramuli.

CERAMIUM flabelligerum, *J. Ag. Advers.* 27.

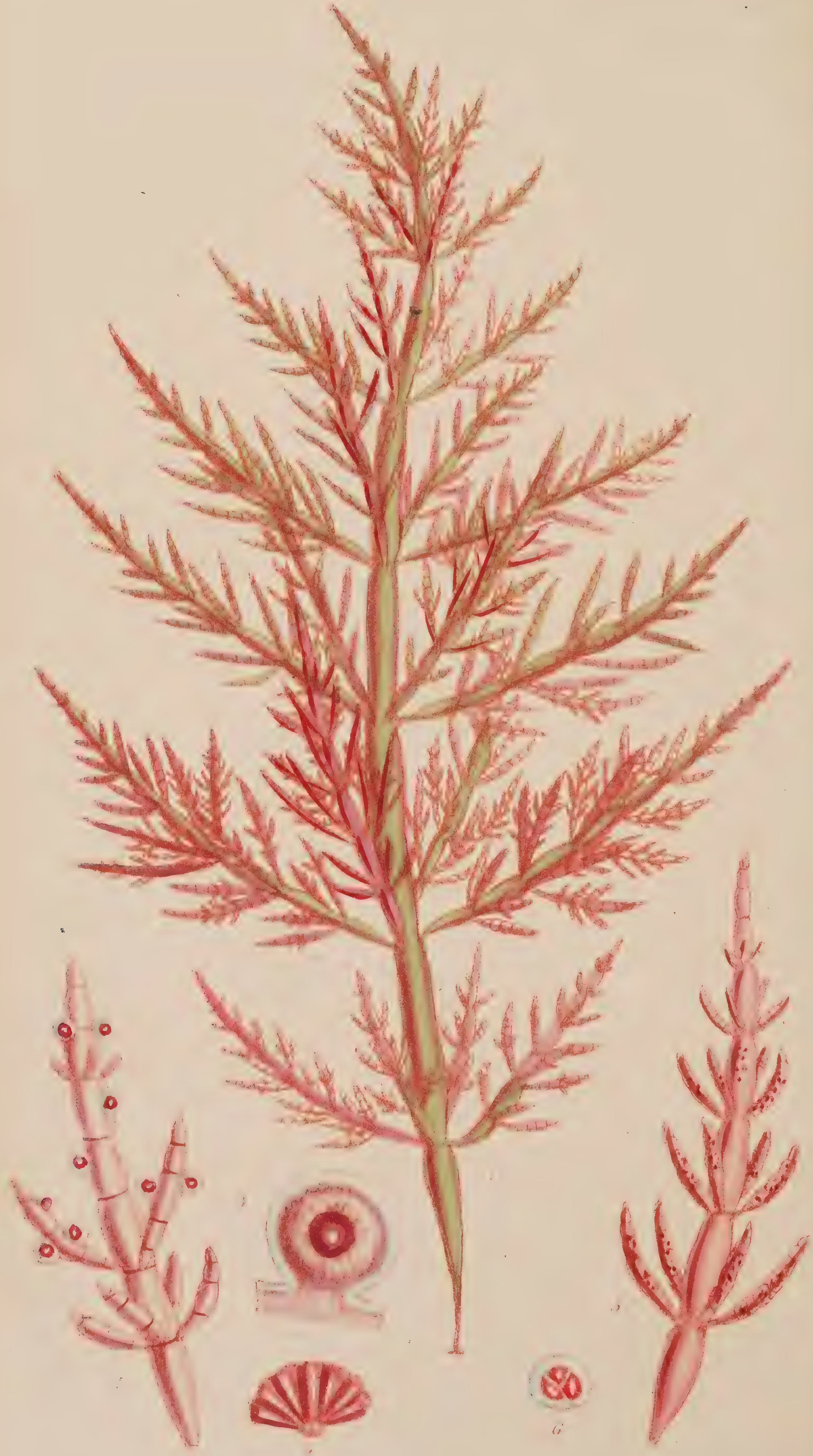
HAB. Parasitical on the smaller Algæ between tide marks. Annual. Summer and Autumn. Rare. Torbay, *Mrs. Griffiths.* Jersey, *Miss. H. M. White.*

GEOGR. DISTR. South of England. Coast of Spain; at Cadiz, *Cabrera.*

DESCR. *Fronds* more or less densely tufted, but not matted together, from two to three inches high, nearly as thick as hogs' bristle below, becoming gradually more slender upwards, and towards the apex as fine as human hair, divided in an irregularly dichotomous manner, distichous, the main divisions having a more or less fan-shaped outline, but not strictly fastigiate, repeatedly forked; the upper branches furnished with more or less numerous, minute, simple or forked, lateral ramuli from one to two lines in length, erecto-patent, somewhat constricted at base, acute and attenuate at the point. *Axils* patent in all parts of the frond. *Apices* generally spreading, sometimes slightly incurved, but never hooked inwards. *Articulations* tolerably uniform, those of the lower part of thestem from once and a half to twice as long as broad, of the upper branches and ramuli about equal in length and breadth, all coated with a stratum of minute, coloured cells, opake, slightly contracted at the dissepiment and there furnished on the outer margin with a single, minute, horizontally patent, subulate, three-jointed prickle. *Tetraspores* large, tri-partite, with wide pericarps, erumpent, whorled round the joints. *Favellæ* dispersed along the sides of the upper branches, consisting of two or more rounded, berry-like lobes, with wide pericarps, containing numerous large granules; the cluster surrounded by several, longish, patent, spindle-form, involucral ramuli. *Colour* a dull red. *Substance* somewhat cartilaginous, not closely adhering to paper.

The external habit of this species is so different from that of the other ciliated *Ceramia* that it can scarcely be confounded with any of them. It bears a much closer resemblance to a small specimen of *C. rubrum,* to which species there is much similarity both in the branching and in the length and structure of the joints; but from which it may be at once distinguished under the microscope by the minute prickle with which each of the joints is armed at its outer edge. I believe that it was first discriminated by Mrs. Griffiths, who communicated specimens to Professor J. Agardh, from whom it received the name here adopted. It is by no means common, nor have I seen any British specimens except those collected by Mrs. Griffiths, and some for which I am indebted to Miss White, who gathered them in Jersey. Professor Agardh has obligingly sent me a specimen from the coast of Spain, which has all the essential characters of the British plant. Perhaps the most nearly allied species to *C. flabelligerum* is *C. monile,* a native of Tasmania, whose joints are armed with similar prickles, but the general branching of the frond and its size are very different.

Fig. 1. CERAMIUM FLABELLIGERUM:—*the natural size.* 2. Part of the filament. 3. Apex of a filament, bearing *tetraspores.* 4. Portion of a filament, with *favellæ* and involucral ramuli. 5. A prickle.



Reeve, imp.

PLATE CXLV.

CHYLOCLADIA KALIFORMIS, *Hook.*

GEN. CHAR. *Frond* (at least the branches) tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with a watery juice, and traversed by a few longitudinal filaments; periphery composed of small, polygonal cells. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped spores on a central placenta; 2, tripartite *tetraspores*, immersed in the smaller branches, near their apices. CHYLOCLADIA (*Grev.*)—from χυλος, *juice*, and κλαδος, a *branch.*

CHYLOCLADIA *kaliformis*; frond subgelatinous, tubular, pyramidal; main stem simple, distended, distantly constricted; branches opposite or whorled, repeatedly compound; ramuli moniliform; capsules spherical, with a pellucid border.

CHYLOCLADIA kaliformis, *Hook. Br. Fl.* vol. ii. p. 397. *Harv. in Mack. Fl. Hib.* part 3. p. 199. *Harv. Man.* p. 72. *Wyatt, Alg. Danm.* n. 24. *J. Ag. Alg. Medit.* p. 111.

LOMENTARIA kaliformis, *Gaill. Res.* p. 20. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 440. t. 55. f. 3. *Zanard, Alg. Adr.* p. 97. *Mont. Fl. Alg.* p. 88.

GASTRIDIUM KALIFORME, *Lyngb. Hyd. Danm.* p. 70. *Grev. Alg. Brit.* p. 117.

CHONDRIA kaliformis, *Ag. Sp. Alg.* vol. i. p. 355. *Ag. Syst.* p. 207. *Spreng. Syst. Veg.* vol. iv. p. 342. *Hook. Fl. Scot.* part 2. p. 106.

GIGARTINA kaliformis, *Lamour. Ess.* p. 49.

FUCUS kaliformis, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 206. t. 18. *Sm. Eng. Bot.* t. 640. *Turn. Syn.* p. 377. *Turn. Hist.* t. 29.

FUCUS verticillatus, *Lightf. Fl. Scot.* p. 962. t. 31.

β. *patens*; frond flexuous, much attenuated; branches opposite, horizontal, flexuous, drawn out into long slender points; ramuli setaceous, opposite or alternate.

LOMENTARIA patens, *Kütz. Phyc. Gen.* p. 440.

γ. *squarrosa*; frond crisped and entangled, variously curved; branches densely whorled; ramuli very numerous, whorled, squarrose or arching, slender.

LOMENTARIA squarrosa, *Kütz. Phyc. Gen.* p. 440. t. 55. f. 4.

HAB. On rocks and stones in the sea, between tide marks, and in from four to fifteen fathoms water. Annual. Spring and Summer. Var. β. and γ. in deep land-locked, sandy or muddy bays. Var. β. Strangford Lough, *Mr. W. Thompson.* Carrickfergus, *Mr. M'Calla.* Var. γ. Roundstone Bay, *Mr. M'Calla.* Torbay, *Mrs. Griffiths.*

GEOGR. DISTR. Northern Atlantic. Baltic and Mediterranean Seas.

DESCR. *Root* minute, scutate. *Fronds* from six to twelve or twenty inches in length, from the thickness of a crow-quill to that of a goose-quill in diameter, rising with a simple stem, which is distended and constricted at intervals of half an inch or an inch, furnished, at each constriction, with a whorl of branches similar to itself in structure, and, in full grown specimens, several times compounded in a similar manner. The general outline is pyramidal, the lowermost branches being longest, the uppermost gradually shorter. *Branches* spreading, more regularly constricted than the stem and at shorter intervals, furnished with whorls of more or less frequently compounded ramuli, the ultimate series of which are constricted into bead-like joints, mostly about as long as broad. *Capsules* globose, without obvious pore, furnished with a wide pellucid pericarp, and containing a dense tuft of pear-shaped spores. *Tetraspores* lodged in the joints of the ramuli. *Substance* gelatinoso-membranous, closely adhering to paper in drying. *Colour* a fugitive pink or purple, often greenish or yellowish in the stem, and, when growing in shallow pools, exposed to strong light, sometimes altogether pale yellow. Var. β. is much less compound, mostly with opposite (*not whorled*) branches, which are drawn out into long, flexuous, slender points, and furnished with a few distant slender ramuli. Var. γ. is the opposite state, forming densely matted tufts, closely whorled, with more numerous branches and ramuli to each whorl, the latter patent or curved backwards.

A well-known plant, common to most of the shores of Europe, and found growing at various depths from about half-tide level to some fathoms below low water mark. Like most species which have a wide range of climate, and which grow at various depths, sometimes on rock, sometimes on sand, and sometimes on the stems of other Algæ, it is subject to very great variations both in size and in the minor details of its branching. Our figure represents what may be considered its normal state, or type of the species, being a young plant growing under favourable circumstances near low water mark. This differs very widely in appearance from either of the deep water varieties, which are briefly characterized as our vars. β. and γ.; and yet few persons who are accustomed to the different aspects which marine plants assume from local causes will be disposed to regard them as anything more than casual forms. As *cabinet species* they appear distinct enough, especially β. whose attenuated branches and almost setaceous ramuli, *opposite*, not *whorled*, seem to mark it decidedly. I have specimens of it from the Baltic and Mediterranean; the latter communicated by Professor Kützing, who regards it, as well as our var. γ., as a distinct species.

Fig. 1. CHYLOCLADIA KALIFORMIS, a small specimen:—*of the natural size.* 2. Branchlet with *capsules*. 3. A *capsule*. 4. Portion of the tuft of spores. 5. Branchlet with tetraspores. 6. A tetraspore.

Plate CXIV.

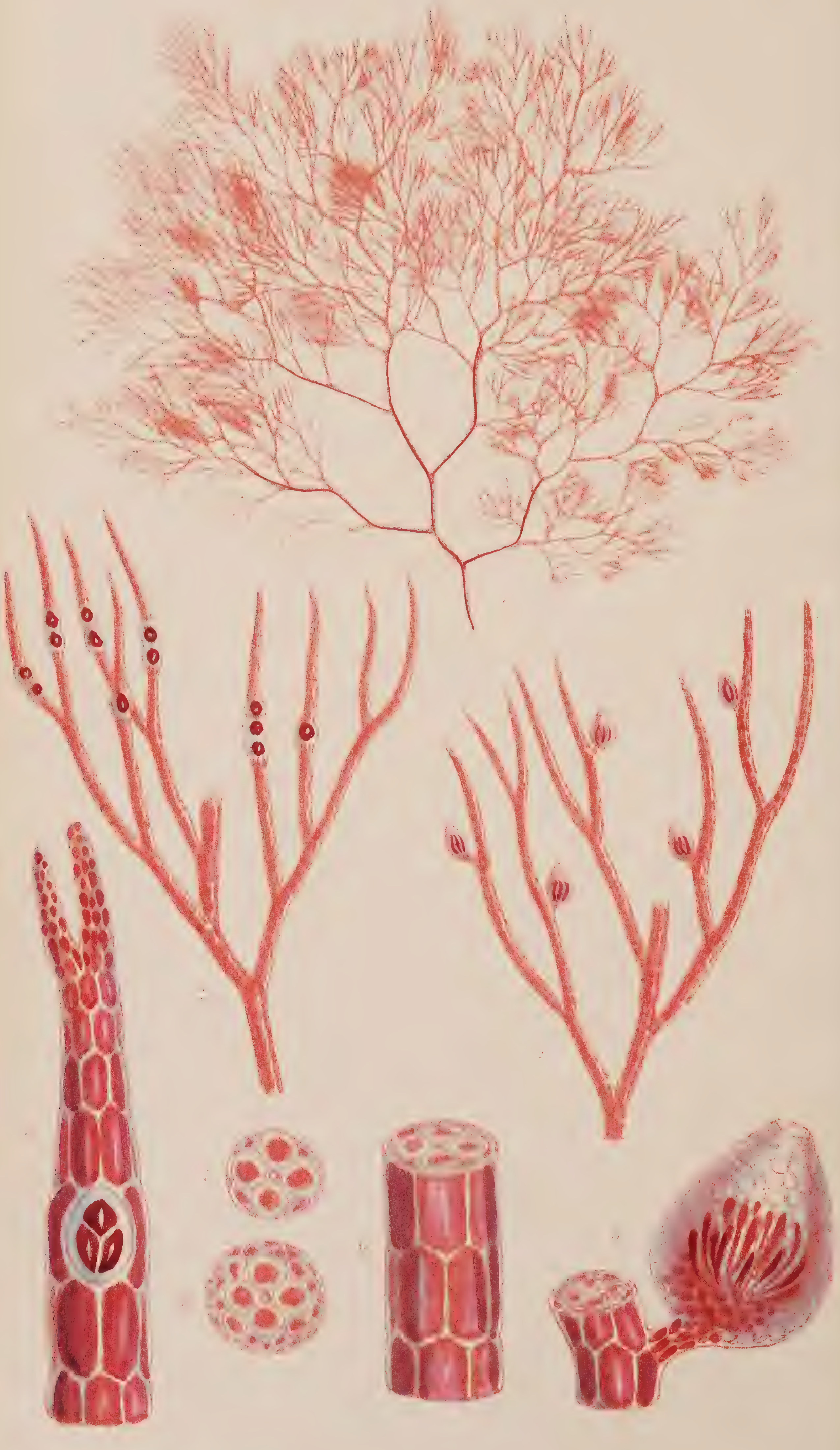


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PLATE CXLVI.

POLYSIPHONIA ELONGELLA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube.*

POLYSIPHONIA *elongella*; filaments setaceous and rigid below, gradually attenuated upwards, irregularly dichotomous, with very patent axils; upper branches flaccid, more or less furnished with lateral, pencilled, multifid, rose or blood-red ramuli; articulations of the branches about as long as broad, those of the ramuli rather longer, both marked with 2–3 broad, parallel, oblong cells; primary tubes four, surrounding a minute cavity, and encompassed with an external coat of small cells; capsules ovate, on a short stalk; dissepiments pellucid.

POLYSIPHONIA elongella, *Harv. in Hook. Br. Fl.* vol. ii. p. 334. *Harv. Man.* p. 96. *Wyatt, Alg. Damn.* no. 84. *J. Ag. Alg. Medit.* p. 135. *Endl. 3rd Suppl.* p. 45. (n. 30).

HAB. On rocks and stones, and on the smaller Algæ, near low-water mark and at a greater depth. Biennial. Spring and Summer. Rather rare. Sidmouth and Torbay, *Mrs. Griffiths* and *Miss Cutler.* Devonport, *Rev. W. S. Hore.* Jersey, *Miss. H. M. White.* Orkney, *Rev. J. H. Pollexfen.* Ardrossan, *Rev. D. Landsborough.* Dublin Bay, *Miss Ball.* Howth, *Miss. Gower.* Killiney, *Mrs. Apjohn.* Belfast Bay, *Dr. Drummond* and *Mr. Thompson.* Larne, *Mr. D. Moore.* Malahide, *Mr. M'Calla.*

GEOGR. DISTR. Coast of France, *Lenormand.* Adriatic Sea, *J. Agardh.*

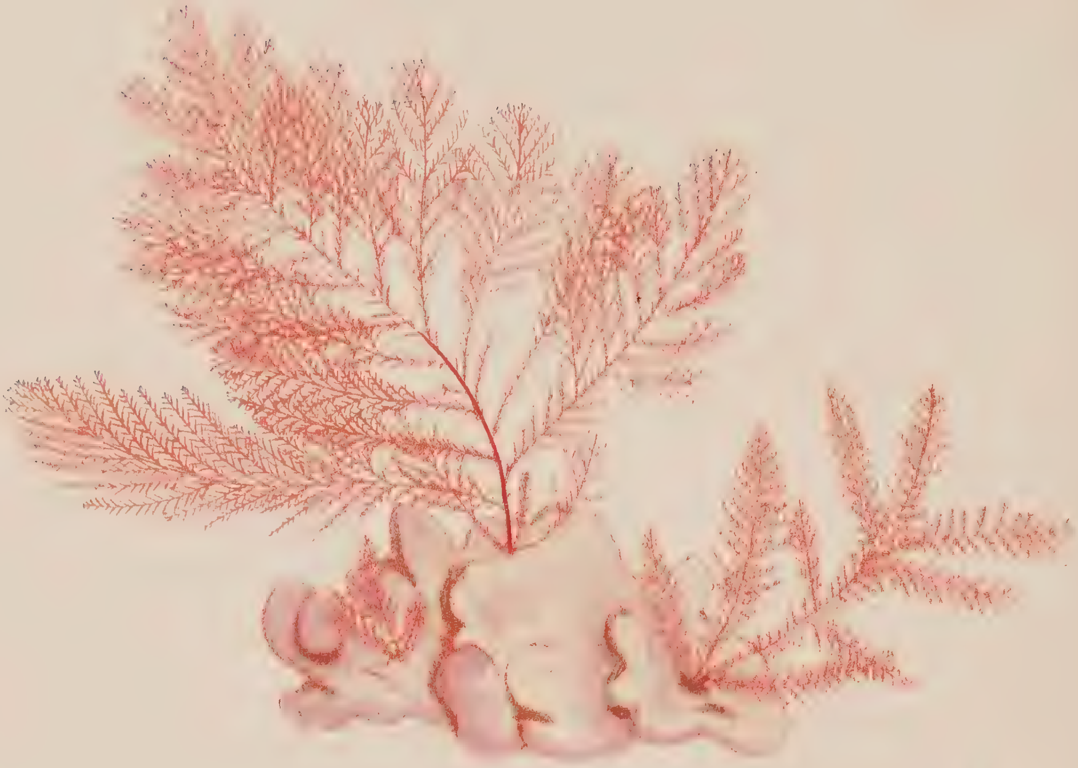
DESCR. *Fronds* from two to four or five inches high, solitary or slightly tufted, as thick as hogs' bristle below, cartilaginous and firm, gradually attenuated and becoming flaccid and tender upwards, divaricately or very patently branched, more or less regularly dichotomous, the axils, especially the lower ones, very wide and obtuse. Upper branches elongate, flexuous, alternately divided, and furnished with lateral, multifid, pencilled ramuli, which are more or less dense on different specimens. These ramuli are excessively tender and flaccid, and of a more or less intense sanguineous-red: late in the season they fall away, leaving naked spine-like branchlets. *Articulations* clearly visible in all parts of the frond, the dissepiments being pellucid; lower articulations shorter than their breadth, those of the branches about equal in length and breadth, those of the ramuli rather longer, but rapidly diminishing toward the apices. A transverse section of the lower part of the stem shows four large *primary* tubes, arranged in a cruciform manner round a minute central cavity, and surrounded by two or three rows of cells, gradually smaller outwards; a section of a branch has four similar primary tubes, surrounded by a very narrow coating of cells. *Capsules* large, ovate, on short slender stalks. *Tetraspores* immersed in the ramuli. *Colour* of the stem dark red, of the ramuli vivid. The upper branches adhere closely to paper in drying, the lower part of the frond very imperfectly.

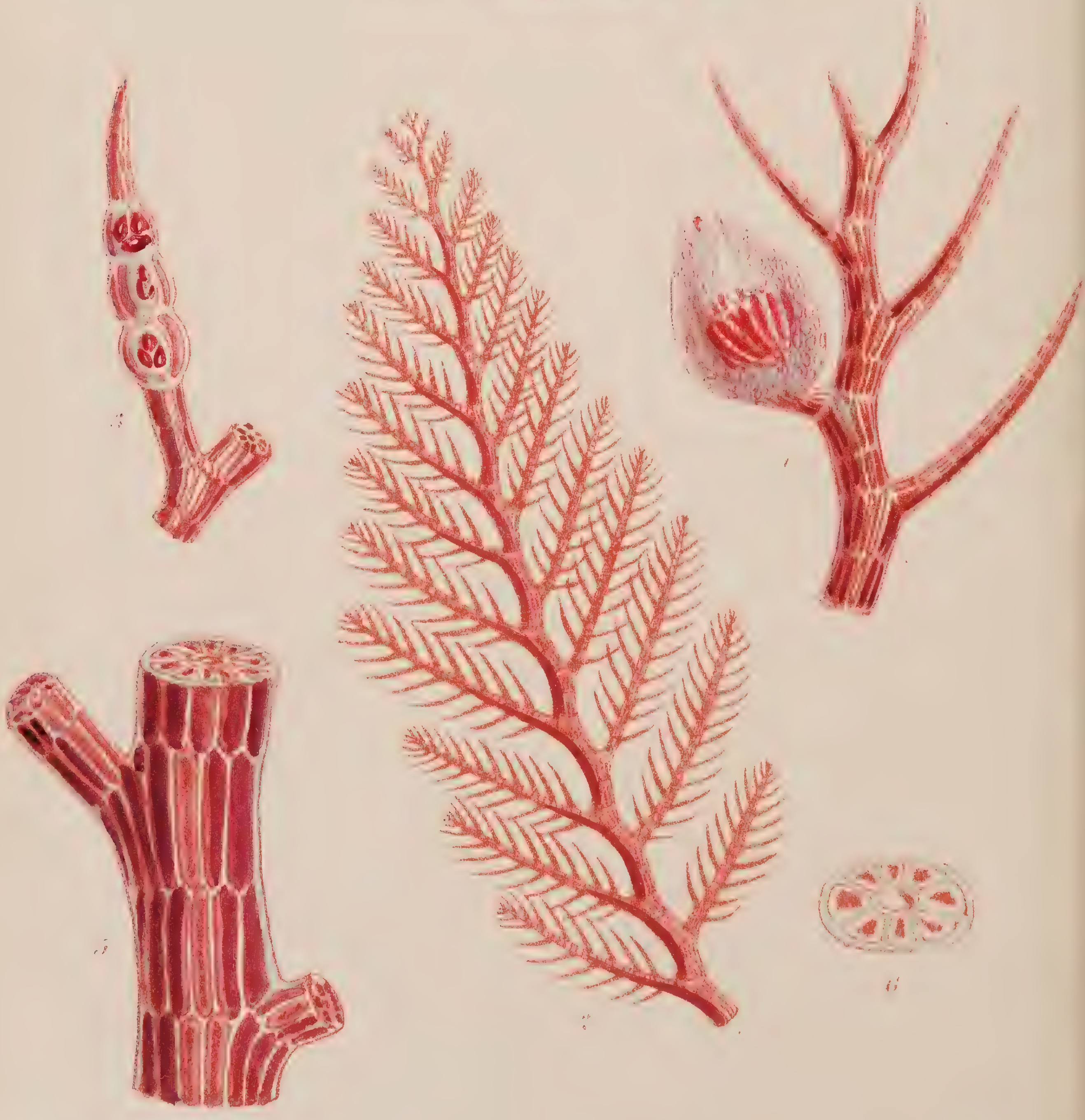
The winter and summer aspects of a deciduous tree are not more different from each other than are specimens of this beautiful plant collected at opposite seasons. Our figure represents it when in perfection, as it is in spring and in the early months of summer, when its branches are clothed with abundant pencils of delicate rosy or blood-red ramuli. At a later period of the year these fall away, and the specimens collected in September or October are usually quite bare, the larger branches only remaining; and these in their nakedness and rigidity, with broken points and spine-like divaricating branches, have little resemblance to the plant of summer. Such specimens as survive the winter throw out with returning spring fresh pencils of branchlets, even in greater profusion than the first year. Such is also the case with *P. elongata,* which our *P. elongella* strongly resembles in miniature, but from which it may readily be known by the pellucid articulations visible in all parts of the plant, and by the ramuli not tapering to the base. Robust specimens of *P. variegata* have a habit very similiar to the present species, but may always be distinguished to the eye by their purple colour, and under the microscope, by the different structure of the joints which in *P. elongella* have but four principal tubes; in *P. variegata* six, or sometimes seven.

P. elongella is one of the many species the discovery of which is due to Mrs. Griffiths, from whose specimens it was described in the British Flora in 1832. Since that period it has been detected on several parts of our coasts, as well as on the Atlantic coast of France, and in the Adriatic Sea. Its nearest affinity is, perhaps, with *P. breviarticulata,* a Mediterranean species.

Mr. Pollexfen's specimen from Orkney, differs from the usual form in being more distichous, and less zigzag in its branching; but as there is no character in its joints to distinguish it further, I am disposed to regard it as a local variety.

Fig. 1. POLYSIPHONIA ELONGELLA :—*of the natural size.* 2. Branchlet with tetraspores. 3. Apex of the same. 4. Branchlet with capsules. 5. A capsule. 6. Portion of the stem. 7. Transverse section of a branch. 8. Similar section of the stem :—*all more or less magnified,*





W. H. H. del. et lith.

PLATE CXLVII.

POLYSIPHONIA PARASITICA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially, or generally, articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate capsules (*ceramidia*), furnished with a terminal pore; and containing a mass of pear-shaped spores. 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολὺς, *many*, and σιφων, a *tube.*

POLYSIPHONIA *parasitica*; filaments slender, rigid, full-red, alternately branched, distichous; branches bi-tripinnate; pinnules closely set, erecto-patent, alternate, awl-shaped, acute; articulations about as long as broad, marked with three or four broad hexagonal oblong cells (or siphons) separated by pellucid spaces; siphons about eight, surrounding a narrow cavity; capsules ovate, on short stalks; tetraspores immersed in swollen pinnules.

POLYSIPHONIA parasitica, *Grev. Fl. Edin.* p. 309. *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Wyatt, Alg. Danm.* no. 175. *Harv. in Mack. Fl. Hib.* part 3. p. 3. *Harv. Man.* p. 85. *Endl. 3rd Suppl.* p. 46.

HUTCHINSIA parasitica, *Ag. Syst.* p. 147. *Ag. Sp. Alg.* vol. ii. p. 103.

HUTCHINSIA Möstingii, *Lyngb. Hyd. Dan.* p. 116. t. 36.

CONFERVA parasitica, *Huds. Fl. Ang.* p. 604. (?) *Dillw. Conf. Syn.* p. 87. *E. Bot.* t. 1429.

HAB. Parasitical on the larger Algæ, and, much more frequently, on various species of *Melobesia*, at the limit of low water, and in from four to fifteen fathoms water. Rather rare; but very generally distributed on the British coasts, from Orkney to Cornwall. Remarkably fine on the Ayrshire coast, and at Arran, *Rev. D. Landsborough.*

GEOGR. DISTR. Atlantic shores of Europe, from the Fœroe Islands to Spain. Malta, *Dr. Lyall.*

DESCR. *Fronds* several from the same base, but not densely tufted, from one to three inches in height, with an undivided or once-forked stem, not quite so thick as hog's bristle, furnished throughout its length with closely-set, alternate, distichous branches. *Branches* very variable in length; in some specimens not half an inch long; in others, almost two inches, regularly bi- or tripinnate; the pinnæ gradually diminishing in length from the base to the apex, closely set, erecto-patent, alternate; pinnules from half a line to a line in length, simple, subulate, alternate, acute. Sometimes the branches are nearly naked, the pinnæ few, and simply pinnate; and towards the base of the branches, in large specimens, the lower pinnæ are short, simple, and recurved. *Articulations* of the pinnæ about as long as broad, those of the pinnules shorter, marked with several oblong tubes, which are pointed at both ends, and separated by hyaline spaces. A transverse section shows eight tubes, surrounding a narrow cavity. *Capsules* ovate, formed out of one of the pinnules, supported on a short stalk, and containing a tuft of pear-shaped spores. *Tetraspores* ranged in a single series, in swollen pinnules. *Colour*, when growing, a fine, clear red; assuming, in drying, more or less of brown; and, if dried without steeping in fresh water, imparting a brown stain to the paper. *Substance* rather rigid, imperfectly adhering to paper.

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I am happy to have this opportunity of returning my best thanks to the *Rev. D. Landsborough*, of Saltcoats, for a series of most beautiful specimens of this charming Alga; by much the finest which I have ever seen. The larger figure in our plate is taken from one of this gentleman's specimens; the smaller from one of the usual size. The difference is strikingly in favour of the Scottish plant. To Mr. Landsborough I am also indebted for the first capsule-bearing plant which I possessed; this kind of fruit being of more rare occurrence than tetraspores.

Polysiphonia parasitica is, I believe, a much more generally distributed species on our shores, than is commonly supposed; but owing to its habitat, it very frequently escapes detection. Unless it be obtained by dredging, which, in favourable localities, is, perhaps, the most certain means of procuring specimens, it can only be had by examining the submersed perpendicular sides of ledges of rock, at the extreme limit of low water. These ledges are frequently coated over with a thin spreading *Melobesia*, or with the base of *Corallina officinalis*. On these Corallines the *Polysiphonia* grows. I once found it on the stem of *Laminaria digitata*, but it was of very small size.

This species is very closely related to *Pol. pennata* of the Mediterranean, and to *P. dendroidea*, a beautiful Peruvian Alga. These plants have a *habit* more resembling that of the genus *Rytiphlæa*, but in their technical characters they do not accord with that group; and there is nothing to distinguish them in structure from other *Polysiphoniæ*. In all three the frond is slightly compressed; but this character is not peculiar to them.

Fig. 1. POLYSIPHONIA PARASITICA, growing on *Melobesia lichenoides*:—*of the natural size*. 2. Portion of a pinna. 3. Pinnule with *tetraspores*. 4. Branchlet with a capsule. 5. Portion of the frond. 6. Transverse section:—*all more or less magnified.*
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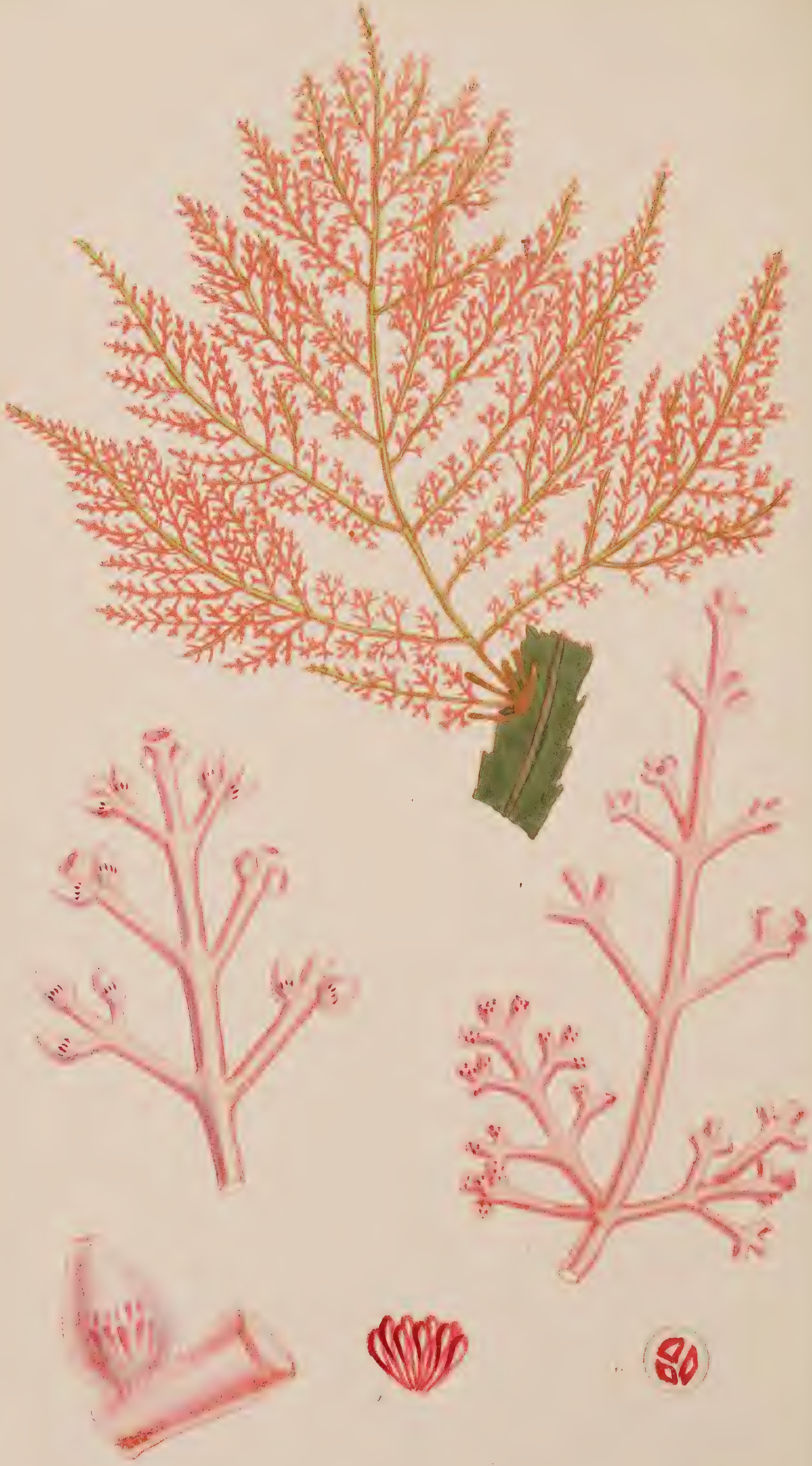

W. H. H. del. et lith.

Reeve, imp.

PLATE CXLVIII.

LAURENCIA OBTUSA, *Lamour*.

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*), in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *obtusa*; frond cylindrical, filiform, repeatedly pinnate; branches patent; pinnæ and pinnulæ mostly opposite, the ultimate pinnules very short and obtuse, sometimes cruciform.

LAURENCIA obtusa, *Lamour. Ess.* p. 42. *Duby, Bot. Gal.* p. 951. *Grev. Alg. Brit.* p. 111. *J. Ag. Alg. Medit.* p. 114. *Endl. 3rd Suppl.* p. 43. *Mont. Algier.* p. 92. *Hook. Br. Fl.* vol. ii. p. 296. *Wyatt, Alg. Danm.* no. 21. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Harv. Man.* p. 70.

LAURENCIA intricata, *Lamx. Ess.* p. 43. t. 3. f. 8, 9.

LAURENCIA gelatinosa, *Lamx. sec. Ag.*

LAURENCIA lutea, *Lamx. sec. Ag.*

LAURENCIA cyanosperma, *Lamx. Ess.* p. 43.

CHONDRIA obtusa, *Ag. Sp. Alg.* vol. i. p. 340. *Syst.* p. 202. *Hook. Fl. Scot.* part 2. p. 105. *Grev. Fl. Edin.* p. 290. *Spr. Syst. Veg.* vol. iv. p. 341. *Kütz. Phyc. Gen.* p. 437.

FUCUS obtusus, *Huds. Fl. Ang.* p. 586. *Turn. Syn.* p. 43. *Turn. Hist.* t. 21. *E. Bot.* t. 1201.

HAB. Parasitical on the smaller Algæ between tide marks. Annual. Summer. Not uncommon on the shores of England and Ireland. Rare in Scotland. Frith of Forth, *Dr. Greville*. Ardrossan and Arran, *Rev. D. Landsborough*.

GEOGR. DISTR. Dispersed throughout the Atlantic and Pacific Oceans, both north and south, in temperate and subtropical latitudes. Mediterranean Sea. Mauritius.

DESCR. *Root*, a small disc, with or without accessory fibres. *Fronds* several from the same base, forming dense, globose tufts, from three to six inches long, cylindrical, of equal diameter throughout, slender, from a quarter to half a line in diameter, furnished with a simple stem, which is closely set throughout with very patent or horizontal, often opposite, lateral branches, which diminish in length from the base to the apex, so that the whole frond has a pyramidal outline. *Branches* subdistichous, or more or less quadrifarious, spirally inserted, repeatedly pinnate; pinnæ opposite, patent, the lower ones often short and multifid, the middle ones longest, lanceolate and simply or doubly pinnate, the upper gradually shorter to the tip. Ultimate *ramuli* very short, obtuse, somewhat clavate, simple, or furnished with two or three small processes above; sometimes compounded in the manner of a Greek cross. *Capsules* formed near the tips of the ramuli, but rarely perfect; more commonly converted into cup-shaped bodies. *Tetraspores* densely imbedded in the tips of the ramuli. *Colour* a fugitive pink, the main branches, and sometimes the whole frond, yellowish or transparent; the ramuli more fully coloured. *Substance* cartilaginous, tender and brittle, soon decaying in fresh water; closely adhering to paper in drying.

This species is as widely dispersed over the world as *L. pinnatifida,* and though not quite so variable as that plant in general appearance, nevertheless exhibits considerable varieties. This is to be expected in a plant which grows as well in subtropical as in temperate waters; and which even extends within the tropics. On our shores, except in colour, it preserves most of the characters represented in the plate; but continental specimens are often much taller in proportion to their breadth, till the pyramidal outline becomes almost as long, in proportion to its base, as an obelisc. When growing in sunny pools the whole plant often becomes pale yellow, preserving merely in the youngest ramuli a rosy hue; but in deeper water, and under the shade of leafy Algæ, all the branches are of a full red.

I believe that *Laurencia obtusa* is always, or, at least, very generally, a parasite on other Algæ; but it appears to be quite indifferent as to the species on which it grows. I have seen it on several plants of very different natures. Most commonly it is found on *Fucus serratus,* or on *Corallina officinalis*: but it also grows on *Chondrus crispus, Polysiphonia nigrescens,* and even on *Sphacelaria cirrhosa.*

Tetraspores are abundantly produced; but *capsules* I have rarely found perfect on British specimens. It is more usual to find the tips of the ramuli converted into those cup-shaped, open bodies, containing yellow flocculi, which are represented in our plate of *L. pinnatifida.*

Fig. 1. LAURENCIA OBTUSA; growing on *Fucus serratus*:—*of the natural size.* 2. Branch with capsules. 3. A capsule. 4. Tuft of spores from the same. 5. Branch with tetraspores. 6. A tetraspore:—*all magnified.*

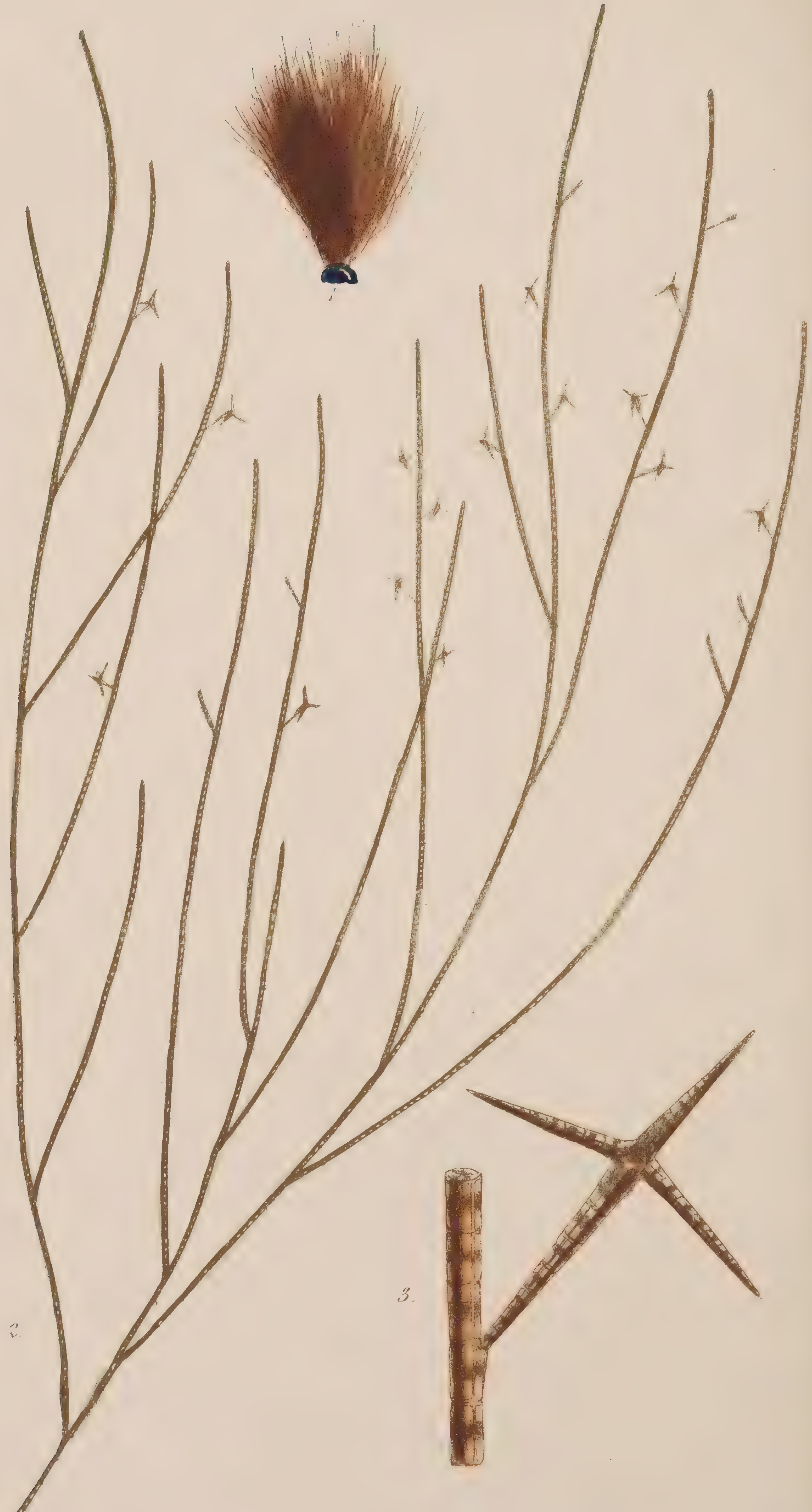
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PLATE CXLIX.

SPHACELARIA FUSCA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles* (or *spores*), borne on the ramuli. SPHACELARIA (*Lyngb.*), —from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *fusca*; filaments densely tufted, capillary, brown, distantly and irregularly branched; branches long and simple, bearing a few clavate or three-forked, minute ramuli; articulations twice as long as broad, marked by a transverse band; spores globose.

SPHACELARIA fusca, *Ag. Sp. Alg.* vol. ii. p. 34. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. Man.* p. 38.

CONFERVA fusca, *Huds. Fl. Ang.* p. 602. *With.* vol. iv. p. 141. *Dillw. Conf.* t. 95.

HAB. On rocks and stones, between tide marks. Very rare. Anglesea, *Rev. Hugh Davies.* Newton Nottage, Glamorgan, *Mr. W. W. Young.* Worms Head, and other places in Gower, *Mr. Dillwyn.* Sidmouth, *Mrs. Griffiths.* St. Michael's Mount, Cornwall, *Mr. Ralfs.*

GEOGR. DISTR. Shores of Wales and South of England.

DESCR. *Fronds* one to two inches high, forming dense pencillate tufts, very slender, irregularly branched in an alternate or spuriously dichotomous manner; branches often secund, very erect, long and simple, of equal diameter throughout. *Ramuli* very few, scattered, minute, attenuate at the base, club-shaped, or furnished immediately below the apex with three, divergent, thorn-like, somewhat horizontal processes. *Articulations* about twice as long as broad, composed of several cells, and marked with a brown transverse band in the centre. *Spores*, according to Dillwyn, globose, scattered, sometimes stalked. *Substance* rigid, not adhering to paper. *Colour* a dark chesnut brown.

* * *

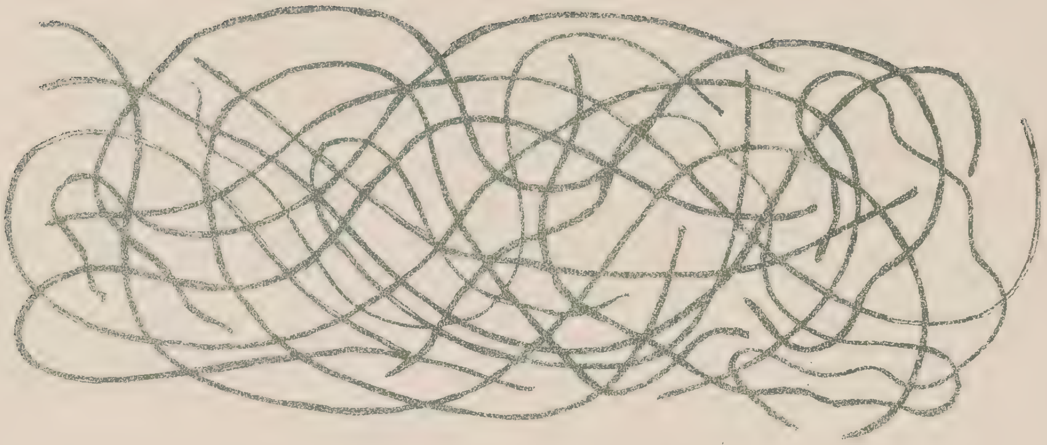
Dillwyn, on whose authority the *Sphacelaria fusca* chiefly rests, gives several stations for it, on the coast of Wales, where it would seem to be pretty common. But except a single specimen sent to me several years ago by Mrs. Griffiths, and another more recently received from Mr. Ralfs, I have seen nothing of the plant; nor am I aware of any other author having found it. It may or may not be the *Conferva fusca* of Hudson, whose account is too brief to form a decided opinion upon. Never having seen a specimen of Mr. Dillwyn's plant, I am not even sure of his synonym, though the magnified portion of his figure is sufficiently like the specimen I have drawn from. Still, his saying that the plant is "from three to five inches long," a size greatly above that of my specimen, throws a doubt on the reference.

As a species, *S. fusca* (or what I take for it) will rank next *S. cirrhosa,* from which it differs by its irregular branching, by the remarkable cruciform scattered ramuli, and something in colour and in the length of the joints. *S. cirrhosa* is parasitical on other Algæ; but too little is yet known of the history of *S. fusca* to say that it is *not* so. No foreign author appears to be acquainted with the plant; Agardh having adopted it on the authority of Dillwyn's figure.

Fig. 1. SPHACELARIA FUSCA: a tuft:—*of the natural size.* 2. A filament. 3. Portion of the same, with one of the three-forked ramuli:—*both magnified.*

Plate CL.

A.



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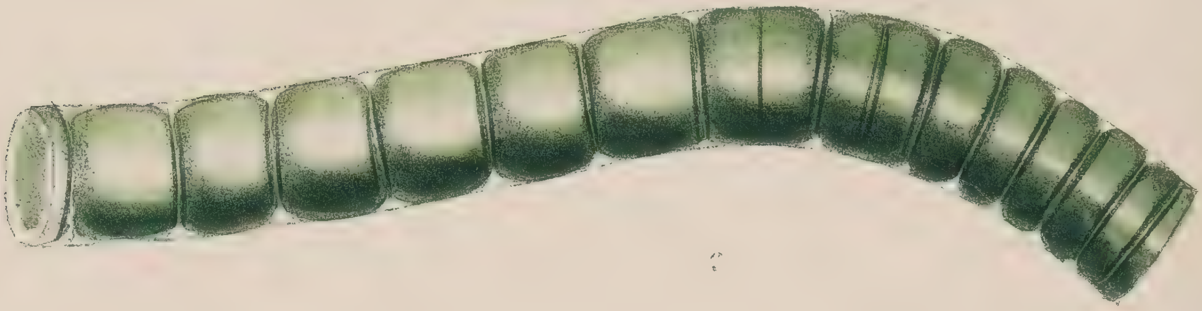

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B.

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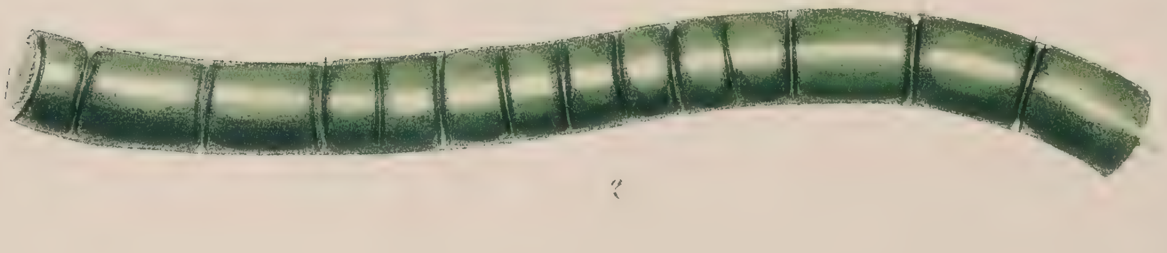

2.

PLATE CL. *A.*

CONFERVA LINUM, *Roth.*

GEN. CHAR. *Filaments* green, jointed, attached, or floating, unbranched. *Fruit,* aggregated granules, or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CONFERVA (*Plin.*) —from *conferruminare,* to *consolidate;* because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *linum;* filaments very thick, of great length, light or dark green according to age, much curled, rigid, forming loosely entangled, harsh strata; articulations as long as broad.

CONFERVA linum, *Roth. Cat. Bot.* vol. i. p. 174. and iii. p. 257. *Fl. Dan.* p. 771. f. 2. *E. Bot.* t. 2363. *Ag. Syst.* p. 97. *Jurg.!* vol. iii no. 10. *Lyngb. Hyd. Dan.* p. 147. t. 50. *Kütz. Phyc. Gen.* p. 260. (*not of Hook. Br. Fl. or Harv. Man.*)

CONFERVA capillaris, *Huds. Fl. Ang.* p. 598. *Lightf. Fl. Scot.* p. 988. *Dillw. Conf.* t. 9.

CONFERVA crassa, *Ag. Syst.* p. 99. *Harv. in Hook. Br. Fl.* vol. ii. p. 352. *Harv. in Mack. Fl. Hib.* vol. iii. p. 225. *Harv. Man.* p. 129. *Kütz. Phyc. Gen.* p. 260.

HAB. In salt-water ditches, near the coast.

GEOGR. DISTR. Shores of Europe.

DESCR. *Filaments* from a few inches to several feet in length, twice as thick as hog's bristle, very much curled, rigid, crisp and brittle, soon becoming flaccid if exposed in the air; lying in thick, but not dense, bundles of considerable breadth, disposed in strata, one above the other. *Articulations* about as long as broad, filled with granular fluid, which in some joints is more dense than in others. Eventually the joints divide in the centre by a transverse line, and the mass separates; a new diaphragm is then gradually formed, and finally a new joint. This species varies much in colour, being sometimes of a pale, at other times a dark green, and is very often mottled with dark and light green. *Substance* rigid-membranous, scarcely adhering to paper in drying.

The plant now figured is what, in British works, is usually called *C. crassa,* a name which originated with Agardh, who regarded the *Conf. capillaris* of Dillwyn, (*Conf. linum* of E. Bot.) as being different specifically from the original *C. linum* of Fl. Dan., and founded a new species upon it. I rather hastily adopted his view in the Br. Flora; and still more incorrectly I took up, from the 'Algæ Appinenses' of Carmichael, another species under the name of *C. linum,* which is quite unlike the plant so called by Roth. That species will be figured in a future number. With regard to the *C. linum* of Roth; that it is the same as our British plant commonly called *C. crassa,* was the opinion of

Roth himself, (Cat. Bot. vol. iii. p. 257.) and is mine, after having examined a fragment of the specimen, published by Jurgens, and referred to by Agardh, for which I am indebted to the kindness of Mr. Berkeley. On placing together under the microscope specimens of *C. linum* from several localities, there may be observed minor differences between them, but all have so many characters in common, that I consider it quite inexpedient to propose more than one species. The *C. linum* of Jurgens is exceedingly like our British plant, and the slight difference may be accounted for by difference of habitat.

A. Conferva linum :—*of the natural size.* 2. Portion of a filament :—*magnified.*

Plate CL. *B.*

CONFERVA SUTORIA, *Berk.*

Conferva *sutoria*; filaments setaceous, extremely long, flexuous, equal, dark green; articulations once and a half as long as broad; interstices pellucid.

Conferva sutoria, *Berk. Gl. Alg.* t. 14. f. 3. *Harv. Man.* p. 128.

Hab. Floating in ditches and pools, subject to the influence of the tide, at Wisbeach, *Rev. M. J. Berkeley*. Penzance, *Mr. Ralfs*.

Geogr. Distr. England.

Descr. *Filaments* several inches to a foot or more in length, as thick as hog's bristle, variously curved and twisted, forming extensive loosely packed bundles or strata, which fill the pools in which they grow. *Articulations* once and a half as long as broad, filled with a dark green fluid, at length separating by a transverse medial line into two portions, which eventually become separate joints. *Colour* dark green, not variegated. *Substance* rigid, not adhering to paper in drying.

I have been favoured by the Rev. M. J. Berkeley with a portion of the specimen which he figured in the 'Gleanings,' when founding the present species; and it so nearly resembles a plant which I have received from Mr. Ralfs, that I have ventured to consider both as belonging to one species; but, to prevent mistakes, I may remark that the figure now given has been taken from Mr. Ralfs' specimen. The general habit of the plant is very similar indeed to that of *C. linum,* mixed with which Mr. Berkeley found it growing; it forms similar loosely bundled masses; but the diameter of the filament is less, and the joints are proportionably longer.

B. Fig. 1 Conferva sutoria :—*natural size.* 2. Portion of a filament :—*magnified.*

Plate CLI

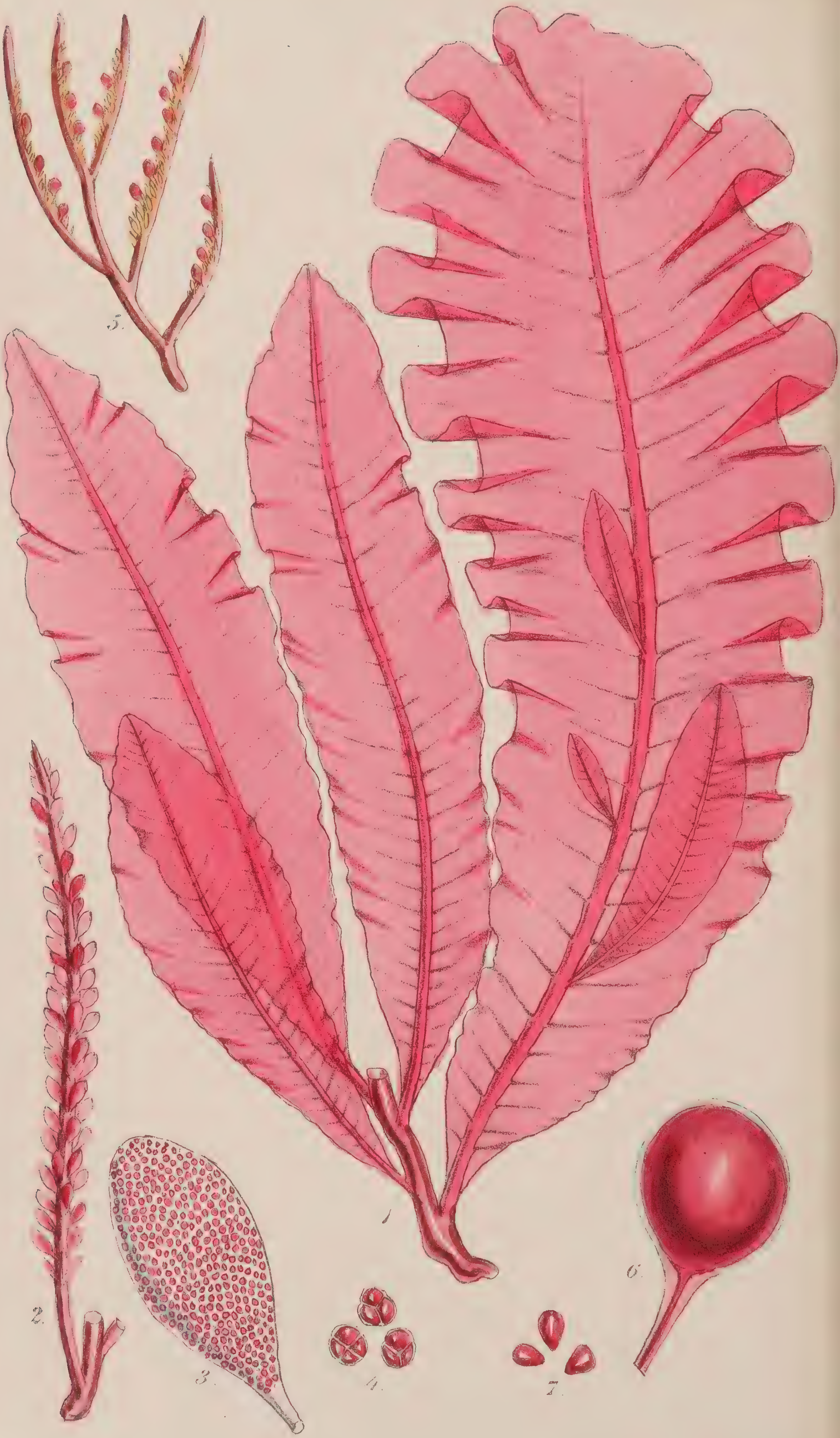

PLATE CLI.

DELESSERIA SANGUINEA, *Lamour.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent mid-rib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*), immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Lamour.*),—in honour of *Baron B. Delessert*, a distinguished Botanist and Patron of Botany.

DELESSERIA *sanguinea*; stem cylindrical, cartilaginous branched, bearing oblong or obovate, transversely veined leaves, entire at the margin; mid-rib percurrent, strong; lateral veins opposite; tubercles stalked, attached (in winter) to the membraneless mid-ribs of old leaves; tetraspores densely aggregated in small *sporophylla*, (produced in winter) on old mid-ribs.

DELESSERIA sanguinea, *Lamour. Ess.* p. 124. *Lyngb. Hyd. Dan.* p. 7. t. 2. *Ag. Sp. Alg.* vol. i. p. 172. *Ag. Syst.* p. 248. *Hook. Fl. Scot.* part 2. p. 100. *Grev. Fl. Edin.* p. 292. *Grev. Alg. Brit.* p. 72. *Hook. Br. Fl.* vol. ii. p. 285. *Harv. in Mack. Fl. Hib.* part 3. p. 191. *Harv. Man.* p. 55. *Wyatt, Alg. Danm.* no. 13. *Endl. 3rd Suppl.* p. 53. *Kütz. Phyc. Gen.* p. 445. t. 67.

WORMSKIOLDIA sanguinea, *Spr. Syst. Veg.* vol. iv. p. 331.

FUCUS sanguineus, *Linn. Syst. Nat.* vol. ii. p. 718. *Lightf. Fl. Scot.* vol. ii. p. 942. *Huds. Fl. Ang.* p. 573. *Stack. Ner. Brit.* t. 7. *Turn. Syn.* vol. i. p. 7. *Turn. Hist.* t. 36. *E. Bot.* t. 1041.

HAB. In deep rock pools, between tide-marks, generally at the shady side of the pool, under projecting ledges of rock. Biennial. Fruiting in winter. Common on the British coasts, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea. A variety found by Dr. Hooker at Hermite Island, Cape Horn.

DESCR. *Root* a hard, conical disc. *Stem* cartilaginous, from one to six or eight inches, or more in length, more or less branched, one to three lines in diameter, nearly cylindrical or variously swollen and mis-shapen, producing on all sides, throughout its length, numerous, irregularly placed leaves. *Leaves* shortly petiolate, from four to eight or ten inches in length, and from one to four or five in breadth, tapering at base, oblong or obovate, obtuse or more or less acute, sometimes lanceolate, when young nearly flat or scarcely undulate, when old very much waved; the margin perfectly entire. *Mid-rib* strong, from half a line to more than a line in diameter, gradually attenuated upwards, pinnated with lateral, patent or subhorizontal, opposite nerves, issuing at short and equal distances, and proceeding towards the margin. Occasionally the leaf is divided in a manner between palmate and pinnate into several deep undulated lobes, whose apices are again lobed; and segment traversed by a branch of the mid-rib, which is likewise pinnated with opposite nerves. *Fructification* of both kinds produced in winter on the mid-ribs of old leaves, which have lost their membrane; 1, spherical *tubercles*, borne on little stalks, mostly along one side of the mid-rib, containing a profusion of ovate spores; 2, obovate sporophylla, densely clothing the mid-rib, and thickly covered with a stratum of minute tetraspores. *Substance* of the leaves delicately membranous, their surface glossy and shining. *Colour* a fine crimson pink. It adheres to paper in drying.

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This fine plant, whether we regard the splendour of its colour or the elegance of its form, is entitled to high rank in the Oceanic Flora, and notwithstanding its common occurrence on all our shores, is never seen without attracting admiration. In favourable localities it reaches to a very large size, the length and breadth of its leaves greatly exceeding what our plate represents, and such specimens are among the most beautiful vegetable objects in nature. It therefore worthily commemorates, as the type of the genus to which it belongs, the services rendered to Botany by one of her most distinguished votaries, whose recent loss will long be severely felt, and whose place in the wide circle of which he was the centre, can never be supplied.

The variety with *lobed* leaves, mentioned in the description, was sent to me by the Rev. D. Landsborough, who gathered it on the coast of Ayrshire. It is a very curious form, showing a tendency towards *D. sinuosa*, from which, in colour and other respects, it widely differs. It has also a considerable likeness to *D. Davisii*, a plant of the Southern Hemisphere, but in that species the lateral nerves are *alternate*, not *opposite*; a character which appears to be constant. Another variety, which I have from the Baltic, has exceedingly narrow, lanceolate leaves, and, until closely examined, might pass for a form of *D. Hypoglossum*. I have seen no British specimens like it.

Dr. Hooker found at Cape Horn, two states of this species, one resembling our British plant, except that each leaf was eighteen inches in length! and proportionably broad; the other with lanceolate leaves, from whose mid-ribs innumerable minute leaflets spring. This last was only found in a young state, and may possibly belong to a distinct species, which should be called *D. Hookeri*.

Fig. 1. DELESSERIA SANGUINEA:—*of the natural size*. 2. Old mid-rib, with sporophylla; *natural size*. 3. A sporophyllum. 4. Tetraspores; *both magnified*. 5. Old mid-ribs, with tubercles; *natural size*. 6. A tubercle. 7. Spores; *both magnified*.
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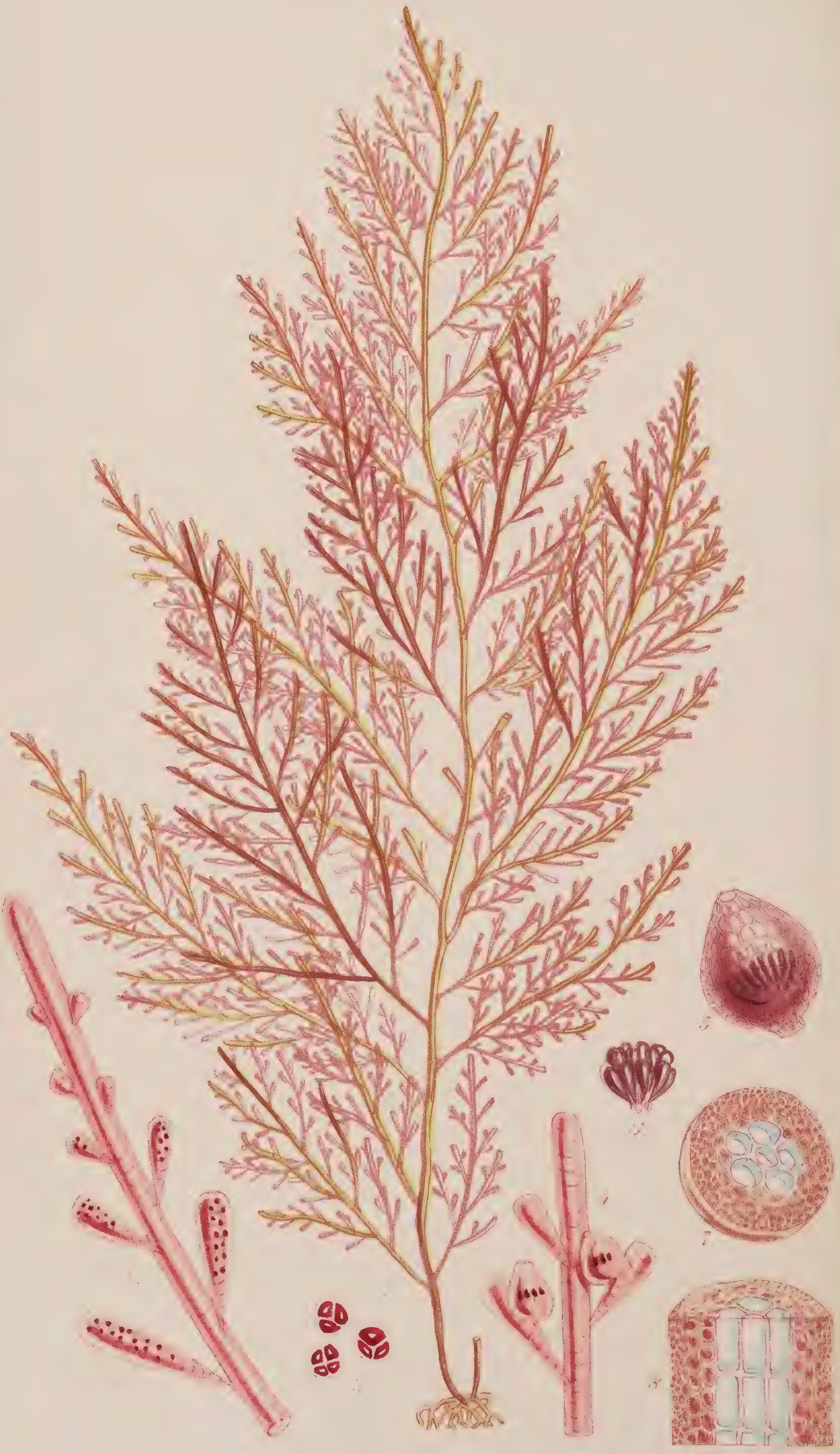
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PLATE CLII.

LAURENCIA DASYPHYLLA, *Grev.*

GEN. CHAR. *Frond* cylindrical or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds on distinct individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted *tetraspores*, imbedded in the ramuli. LAURENCIA (*Lamour.*),—in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *dasyphylla*; frond cylindrical, filiform, decompound-pinnate or irregularly branched; branches erecto-patent; ramuli short, club-shaped, obtuse, transversely striate, very much attenuated at the base.

LAURENCIA dasyphylla, *Grev. Alg. Brit.* p. 112. t. 14. f. 13–17. *Hook. Br. Fl.* vol. ii. p. 296. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Harv. Man.* p. 70. *Wyatt, Alg. Danm.* no. 71. *J. Ag. Alg. Medit.* p. 113. *Mont. Algier.* p. 95. *Endl. 3rd Suppl.* p. 43. *Hook. fil. and Harv. in Lond. Journ. Bot.* vol. vi. p. 401.

LAURENCIA cæspitosa, *Lamour. Ess.* p. 43. *fide Ag.*

CHONDRIA dasyphylla, *Ag. Sp. Alg.* vol. i. p. 350. *Ag. Syst.* p. 205. *Spreng. Syst. Veg.* vol. iv. p. 342. *Kütz. Phyc. Gen.* p. 436. t. 55. f. 2.

GIGARTINA dasyphylla, *Lamour. Ess.* p. 48.

FUCUS dasyphyllus, *Woodw. in Linn. Trans.* vol. ii. p. 239. t. 21. *Turn. Syn.* p. 38. *Turn. Hist.* t. 22. *Sm. E. Bot.* t. 847.

β. *squarrosa*; tufts intricate; fronds irregularly branched; the branches arched, and more or less recurved; ramuli frequently attenuated at the apex.

HAB. On stones and shells in pools, near low-water mark, generally where the surface is covered with sand or mud. β. dredged in 4–5 fathoms water. Annual. Summer. Frequent, on the shores of Great Britain, Ireland, and the Channel Islands. β. in Plymouth Sound, *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic shores of Europe and America. Mediterranean and Baltic Sea. West Indies, *Agardh*. Tasmania, *Mr. Gunn*. Cape of Good Hope, *Herb. Mertens*.

DESCR. *Root* accompanied by creeping fibres. *Fronds* several from the same base, from four to twelve inches long, or more, half a line in diameter, cylindrical, generally with an undivided, or once forked principal stem, closely set with lateral branches, the lowermost of which are longest, the rest gradually lessening upwards, so that the outline is pyramidal. *Branches* either alternate, or opposite, or two or three consecutively from the same side of the stem, more or less quadrifarious, erecto-patent, bearing a second or third series of similar, but smaller branches; the last of which are furnished with short patent, club-shaped, obtuse ramuli, from one to four lines in length, and very much attenuated at their insertion. Sometimes the branching is very dense and bushy, at other times the main branches are few, distant, and little divided. All the young branches and ramuli are transversely striate, as if jointed, owing to a peculiar arrangement of the cells of the axis. *Fructification*; ovate *capsules* or *ceramidia*, sessile on the smaller branches, containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in the ramuli. *Substance* cartilaginous, soon decomposing and becoming gelatinous, and closely adhering to paper in drying. *Colour* varying from a dark purple to a pale pink, or even yellowish, according to exposure.

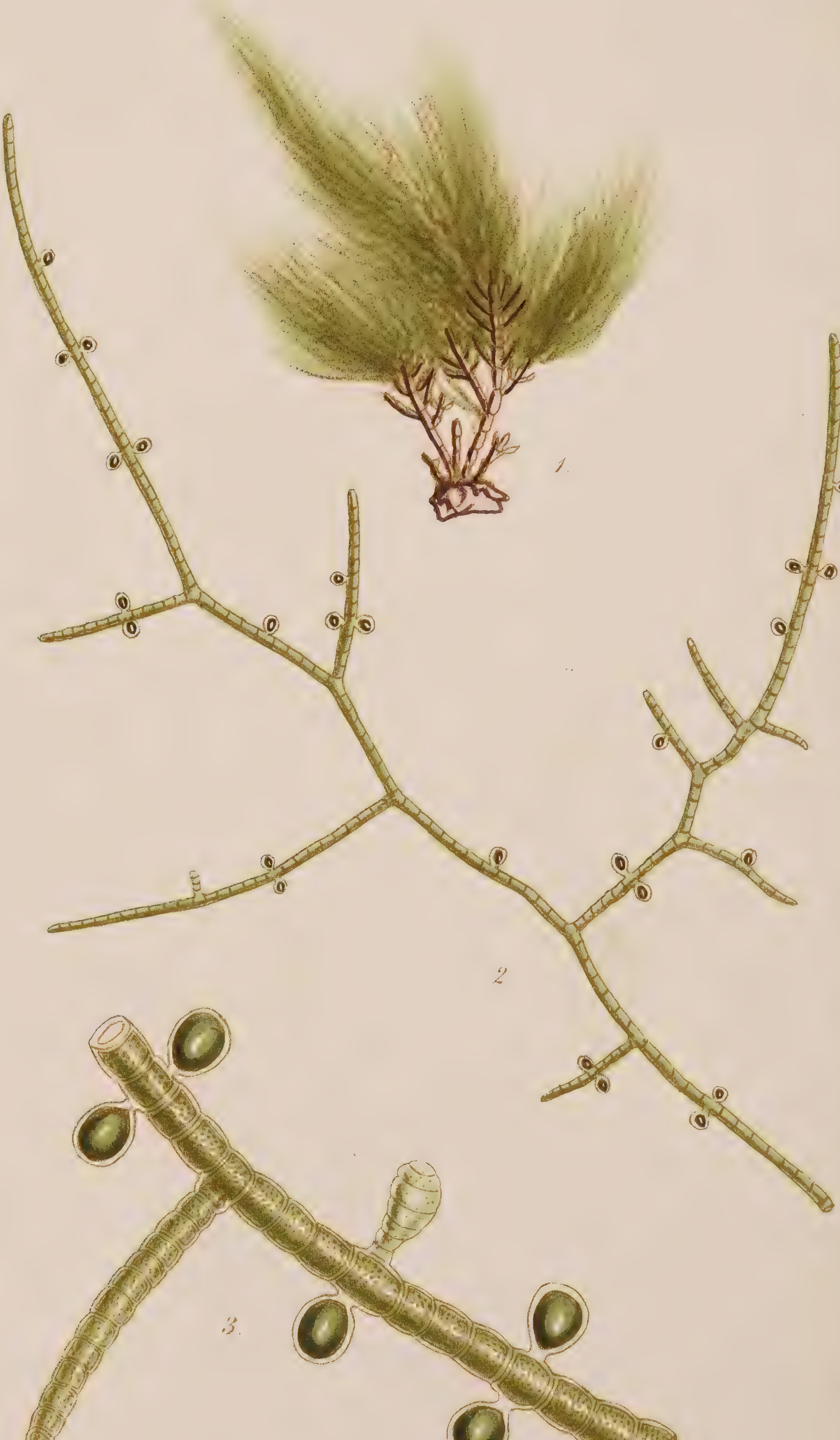
Laurencia dasyphylla belongs to a section of the genus distinguished by having a jointed axis, composed of four or five large cells surrounding a central cavity, exactly as in *Rytiphlæa*; and as these cells are all of equal length, their upper and lower extremities form transverse lines, which, seen through the minute cells of the surface, have the appearance of striæ. In the present species these striæ are at very short intervals. They are much more apparent in the younger parts of the frond, but the structure on which they depend is equally obvious, on dissection, in all parts.

Our variety *β*., from its long, almost naked, arching stems, recurved branches, and ramuli lengthened out into a fine, or almost cirrhose point, with the occasional interspersion of setaceous processes, has a very peculiar aspect, and may appear, on a hasty inspection, to be a distinct species; or to a person unacquainted with *L. tenuissima*, it may possibly be mistaken for that plant. But a more careful examination shows it to be perfectly analogous to the squarrose variety of *Chylocladia kaliformis*, and as both plants are found in similar situations, their peculiar characters probably depend on local causes acting similarly upon them. In the variety now under review, it rarely, if ever, happens that *all* the ramuli are drawn into long points, or *all* the branches arched and recurved; but the majority are in these conditions.

It will be seen that the geographical distribution of this species is very extensive. I have received it from many distant quarters, both of the Northern and Southern Hemispheres, but have not gathered it at the Cape of Good Hope, whence it appears to have been sent to Prof. Mertens. There is, however, a Cape species figured in my NEREIS AUSTRALIS (t. 31.), which somewhat resembles it, but is truly distinct.

Fig. 1. LAURENCIA DASYPHYLLA:—*of the natural size*. 2. Apex of a branch, with tetraspores. 3. Tetraspores. 4. Apex with capsules. 5. A capsule. 6. Tuft of spores from the same. 7. Transverse seition of the frond. 8. Longitudinal section:—*all more or less magnified*.

Plate CLIII



W. H. H. del. et lith.

Reeve, Benham & Reeve imp.

PLATE CLIII.

ECTOCARPUS PUSILLUS, *Griff.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from εκτος, *external*, and καρπος, *fruit.*

ECTOCARPUS *pusillus*; filaments tufted, interwoven, sparingly branched; branches distant, very patent, flexuous, bearing a few, irregular, patent, flexuous ramuli; spores roundish-oblong, subsessile, frequently opposite.

ECTOCARPUS pusillus, *Griff. in Wyatt. Alg. Danm.* no. 212. *Harv. Man.* p. 41. *E. Bot. Suppl.* t. 2872.

HAB. Parasitical on several of the smaller Algæ. Annual. Rare. Torquay, *Mrs. Griffiths.* Land's End, St. Michael's Mount, and Ilfracombe, *Mr. Ralfs.*

GEOGR. DISTR. South Coast of England.

DESCR. *Filaments* forming intricate, more or less interwoven tufts, from three to six inches in length, resembling "pale-brown wool;" slender, subsimple or sparingly branched, flexuous or somewhat zigzag, of equal diameter throughout, obtuse. *Branches* few, distant, very patent, very unequal in length, variously curved, obtuse, naked, or having a few very patent or horizontal, obtuse, unequal, scattered ramuli. *Spores* generally abundant, scattered over the filaments, roundish-oblong or sessile or subsessile, very elliptical, frequently opposite. In some cases the empty spore-case, after it has discharged the spore, alters its form, acquires joints, and seems to elongate into a ramulus. *Articulations* of the principal branches rather longer than broad, filled with granular fluid, contracted at the joints. *Substance* membranous, void of gloss, adhering, but not very closely, to paper in drying. *Colour*, when young, greenish olive, becoming gradually a pale brown.

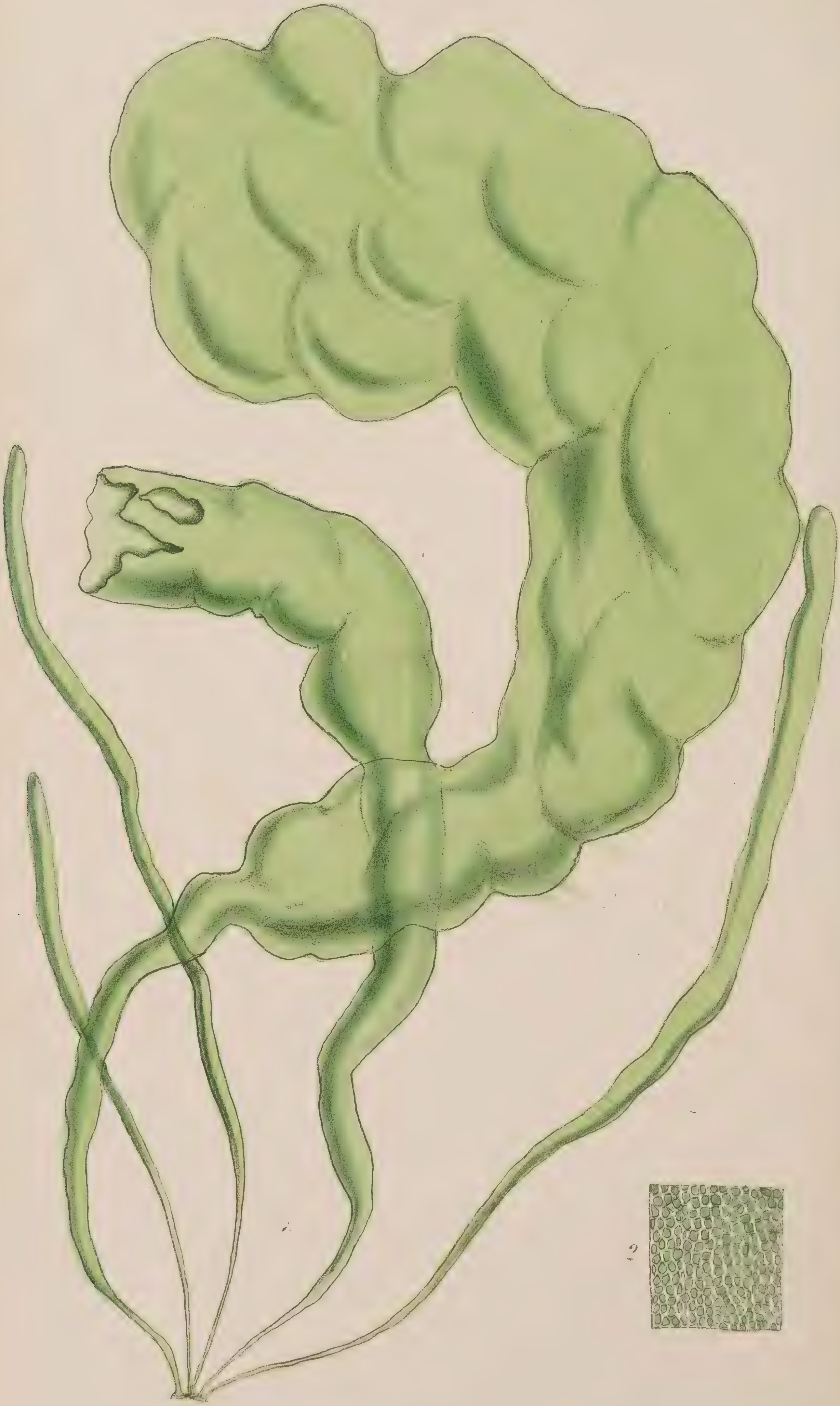
One of the least beautiful forms of the genus, but not without interest, as a connecting link between the simpler and more branching species. It was first found by Mrs. Griffiths in the year 1835, and first made known to botanists in the excellent, and often quoted, 'Algæ Danmonienses' of Mrs. Wyatt. It grows on several of the smaller Algæ, which it clothes with shaggy flocculi, compared by Mrs. Griffiths to tufts of "pale-brown wool." In drying it sometimes assumes a green colour.

The nearest species, among British plants at least, to which it approaches, is the *E. crinitus* of Carmichael, a little-known plant, having a very similar mode of branching and general habit; but differing in its greener colour, larger size, and more especially in the form of its fruit, and in the locality in which it is found.

Ectocarpus pusillus has not, that I am aware, been noticed anywhere save on the south coast of England, but it is one of those *unobtrusive* plants, if I may so call them, which, unless closely looked for, are easily over-looked; and as it has few beauties to recommend it to the mere gatherer of "pretty things," it may often be neglected as not worth notice, or as being some other plant in an imperfect state. It is no easy matter, at all times, to recognize the different *Ectocarpi* by the naked eye, and this accounts for so many species of this genus being passed over by persons who are unaccustomed to the microscope.

Fig. 1. Ectocarpus pusillus; growing on *Corallina officinalis*:—*of the natural size*. 2. Portion of a filament, in fruit:—*magnified*. 2. Portion of the same:—*more highly magnified*.

Plate CLIV.



W. H. H. del. et lith.

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PLATE CLIV.

ENTEROMORPHA INTESTINALIS, *Link.*

GEN. CHAR. *Frond* tubular, membranaceous, of a green colour and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link.*),—from εντερον, an *entrail*, and μορφη, *form* or *appearance*.

ENTEROMORPHA *intestinalis*; fronds perfectly simple, elongated, becoming inflated, obtuse, tapering extremely to the base.

ENTEROMORPHA intestinalis, *Link. Hor. Phys. Ber.* p. 5. *Grev. Alg. Brit.* p. 179. *Hook. Brit. Fl.* vol. ii. p. 313. *Harv. in Mack. Fl. Hib.* part 3. p. 242. *Harv. Man.* p. 174. *Wyatt, Alg. Danm.* no. 80. *E. Bot. Suppl.* t. 2756. *Kütz. Phyc.* p. 300.

SOLENIA intestinalis, *Ag. Syst. Alg.* p. 185. *Spr. Syst. Veg.* vol. iv. p. 367.

SOLENIA Bertolini, *Ag. Syst.* p. 185. *Spr. Syst. Veg.* vol. iv. p. 367.

SCYTOSIPHON intestinalis, *Lyngb. Hyd. Dan.* p. 67.

FISTULARIA intestinalis, *Grev. Fl. Edin.* p. 300.

ILEA intestinalis, *Gaill. Dict. Sc. Nat.* vol. 53. p. 373.

TETRASPORA intestinalis, *Desv. Fl. Angers.* p. 17.

ULVA intestinalis, *Linn. Huds. Fl. Ang.* p. 568. *Lightf. Fl. Scot.* p. 968. *Ag. Syn.* p. 45. *Ag. Sp. Alg.* vol. i. p. 418. *Hook. Fl. Scot.* part 2. p. 91.

CONFERVA intestinalis, *Roth. Cat. Bot.* vol. i. p. 159.

HAB. Attached to various substances in the sea, between tide-marks; also in brackish and fresh-water ditches near the coast. Often floating. Annual. Summer. Very common.

GEOGR. DISTR. In similar situations, in most parts of the world.

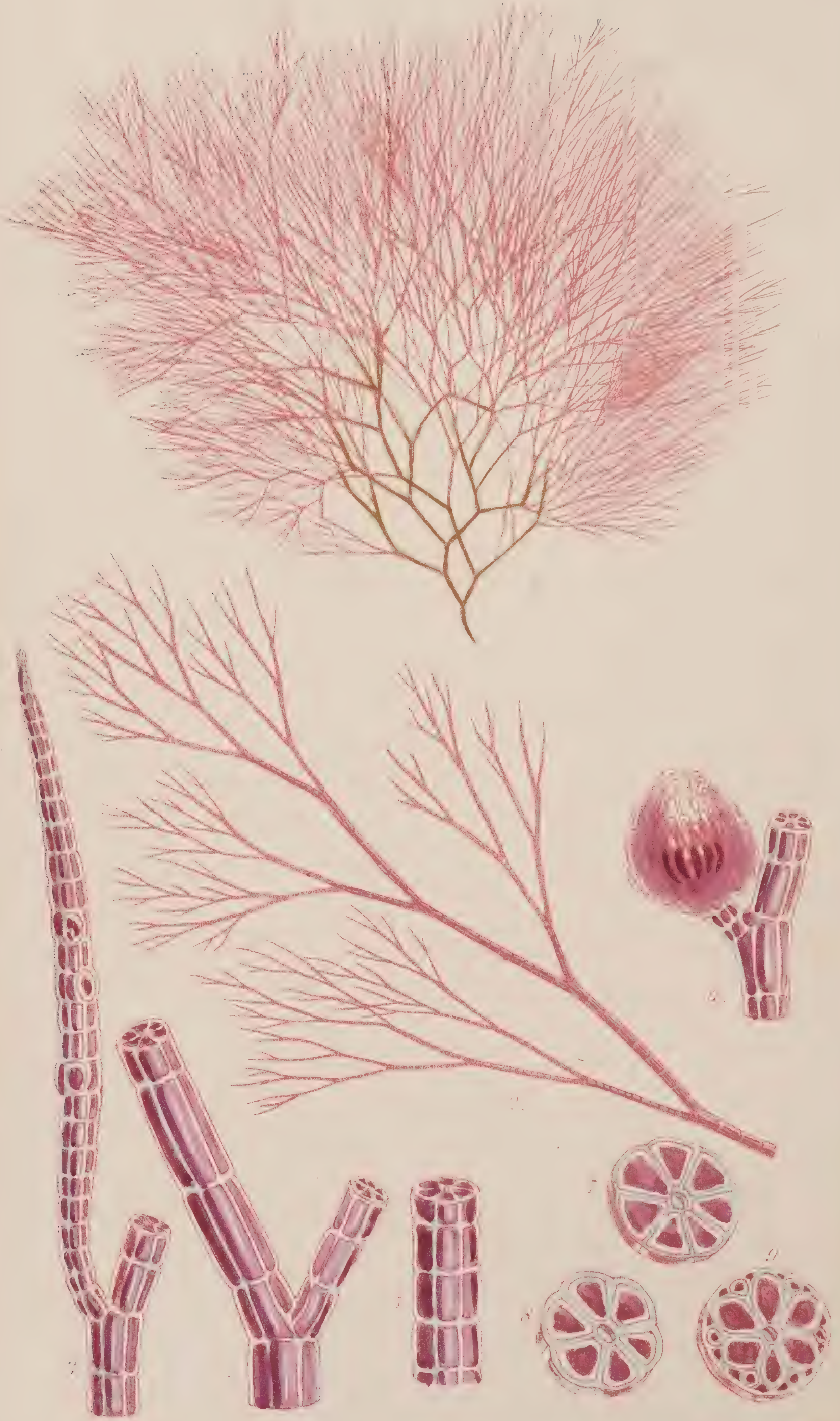
DESCR. *Root* a minute, scutate disc. *Frond* from a few inches to one or more feet in length, and from a line to three or four inches, or more in diameter, tubular, obtuse, tapering at base to little more than the diameter of hog's bristle, gradually becoming inflated upwards, and in old age often swelling out into a large membranous bag, which is variously crisped and curled. Sometimes the whole frond is compressed, and very much crisped. *Substance* thin and membranous, but not gelatinous, not closely adhering to paper in drying. *Colour* varying from a transparent yellowish green, to a full grass-green; in old age and decay fading to a dirty white. Under the microscope, a portion of the frond exhibits the appearance of a transparent membrane, covered with green, unequal, angular cells.

A very common shore plant in all parts of the world, extending from the limits of vegetation in the Northern Hemisphere through all intervening latitudes to a similar point in the south; and inhabiting not merely the sea, but brackish, or even fresh-water, ditches in the neighbourhood of the coast. It varies greatly in size, and in the degree of inflation, but in no other characters. Broad varieties of *E. compressa* strongly resemble some of its states, but these are always *branched,* though often in a very slight degree ; whereas *E. intestinalis* is invariably simple. The compressed variety has most the look of a distinct species, and may be sometimes confounded with *Ulva linza,* under which name I have sometimes seen it in Herbaria ; but the form of these plants is sufficiently different, the one being truly lanceolate, the other obtuse at one end, and very much attenuated at the other.

I am indebted to the Rev. J. Pollexfen for a prepared specimen of Sea-weed, which seems to be an *Enteromorpha,* probably our *E. intestinalis,* and which is used by the inhabitants of Japan as an ingredient in their soups, much as Macaroni is employed with us. Thunberg, in his travels, mentions that several of the *Ulvæ* and *Fuci* are so employed by the Japanese. In the present instance, the fronds have been freed of their salt, bleached, and tied up in cylindrical bundles, about a foot in length, and four inches in diameter, and, at first sight, have the look of Isinglass. The specimen was given to Mr. Pollexfen by Mr. Reeves of Clapham, who had it from a Dutch gentleman, to whom it had been sent from Batavia, to which place vessels trading to Japan bring it with other articles. It is also said to be in use in China.

Fig. 1. ENTEROMORPHA INTESTINALIS, in various stages of growth :—*of the natural size.* 2. Minute portion of the surface :—*magnified.*

Plate CLV.



Reeve. Benham & Re

PLATE CLV.

POLYSIPHONIA VARIEGATA, *Ag.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, containing a mass of pear-shaped spores; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—from πολυς, *many*, and σιφων, a *tube.*

POLYSIPHONIA *variegata*; filaments brownish-purple, or greenish, setaceous, and rigid below, gradually attenuated upwards to a capillary fineness, dichotomous, the lower axils very patent; branches somewhat zig-zag, elongated, much divided, set with lateral, capillary and very flaccid, multifid, purple ramuli; articulations near the base shorter than their breadth, twice as long as broad in the principal branches, and gradually becoming shorter upwards, marked with three, broad, parallel, oblong cells, separated by pellucid spaces; tubes six or rarely seven, surrounding a minute cavity; capsules ovate, on a short stalk.

POLYSIPHONIA variegata, *J. Ag. Alg. Medit.* p. 129. *Endl. 3rd Suppl.* p. 45. *Kütz. Phyc. Gen.* p. 424.

POLYSIPHONIA peucedanoides, *Mont. Herb.*

HUTCHINSIA variegata, *Ag. Syst.* p. 153. *Ag. Sp. Alg.* vol. ii. p. 81.

GRAMITA peucedanoides, *Bonnem. Mem. Mus.* 1824.

HAB. On mud-covered rocks in bays and estuaries, also on *Zostera, Chorda filum,* floating timber, &c. Annual. Summer and autumn. Very local. St. German's River (1846), *Mr. Rohloff.* Beggar's Island, Trevol, Torpoint, and various other places near Plymouth, *Rev. W. S. Hore* and *Dr. J. Cocks.*

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas; very abundant at Venice. West Indies, *Agardh.* Atlantic shores of N. America, *Prof. Bailey*, &c.

DESCR. *Fronds* forming dense tufts, from four to eight or ten inches long, as thick as hog's bristle and somewhat rigid at base, gradually attenuated upwards, and becoming more flaccid until they pass away into a capillary or byssoid fineness. *Filaments* very much branched, dichotomous, the lower axils very patent or divaricating, close together, the upper gradually more distant and less spreading; secondary branches somewhat virgate, zig-zag, set with more or less divided, and more or less dense dichotomous ramuli, whose axils are very acute; ramuli very flaccid and slender. *Articulations* in the lower part of the filament shorter than broad, sometimes opake (in old plants); in the branches once and a half to twice as long as broad; gradually shorter in the ramuli; all of them marked with three broad tubes. A cross section of a branch shows six, or rarely seven, radiant cells; that of an old stem has a more or less complete row of external cellules. *Capsules* broadly ovate, plentiful on the lesser branches and ramuli, shortly stalked. *Tetraspores* small, imbedded in slightly swollen ramuli. *Colour* of the lower part of the stem often greenish, of the upper, and especially of the ramuli, more or less dark-purple. *Substance* rigid below, flaccid and gelatinous above.

It was with much pleasure that I received, in the summer of 1846, from my friend Mr. Rohloff, a specimen of this interesting and beautiful species, which he was so fortunate as to discover in that year; and I have to thank him, as well as my friends Mr. Hore and Dr. Cocks, for a liberal supply of specimens gathered in several localities near Plymouth, in the summer and autumn of 1847. It appears to be an abundant species in that neighbourhood, where it grows in the greatest luxuriance. As yet no other locality in Britain has been recorded, but it will probably hereafter be found in similar situations on the south coast of England, and south and west of Ireland. The favourite locality of this plant seems to be mud-banks, or mud-covered rocks. It requires some algological zeal to hunt over such ground,—which, to many collectors, would appear little likely to yield anything so beautiful; yet such ground is very favourable to the growth of many of this genus, and of the finest *Callithamnia*.

No species need be more distinct than this is. Its habit is very like that of *P. elongella*, it is true, but the purple colour affords an obvious character; while the *six tubes* of the stem furnish an important distinction from that, and all other British species yet known.

P. variegata is widely dispersed through the warmer latitudes of the Atlantic, and abounds on certain parts of the Mediterranean and Adriatic shores. Indeed, where it establishes itself, it generally occurs in quantity. At Venice it is the commonest of the genus; but Venetian specimens are greatly inferior in size and beauty to some of their Plymouth brethren. Those which I have received from Dr. Bailey of New York are nearest to the luxuriance of the latter.

My friend Dr. Montagne contends that the specific name *peucedanoides*, under which this plant was described by Bonnemaison, in the same year that Agardh published it under the name here adopted, should be preferred. It has only this inconvenience, the changing a name now universally known, for one which is little known, and of which the priority, its only recommendation, is disputable. We have no proof that Agardh was acquainted with Bonnemaison's synonyme at the time he published the 'Systema.'

Fig. 1. Polysiphonia variegata :—*of the natural size.* 2. Apex of a branch, with lateral ramuli. 3. A ramulus. 4. Portion of a branch. 5. Portion of the stem. 7, 8. Sections of branch. 9. Section of old stem :—*all more or less highly magnified.*

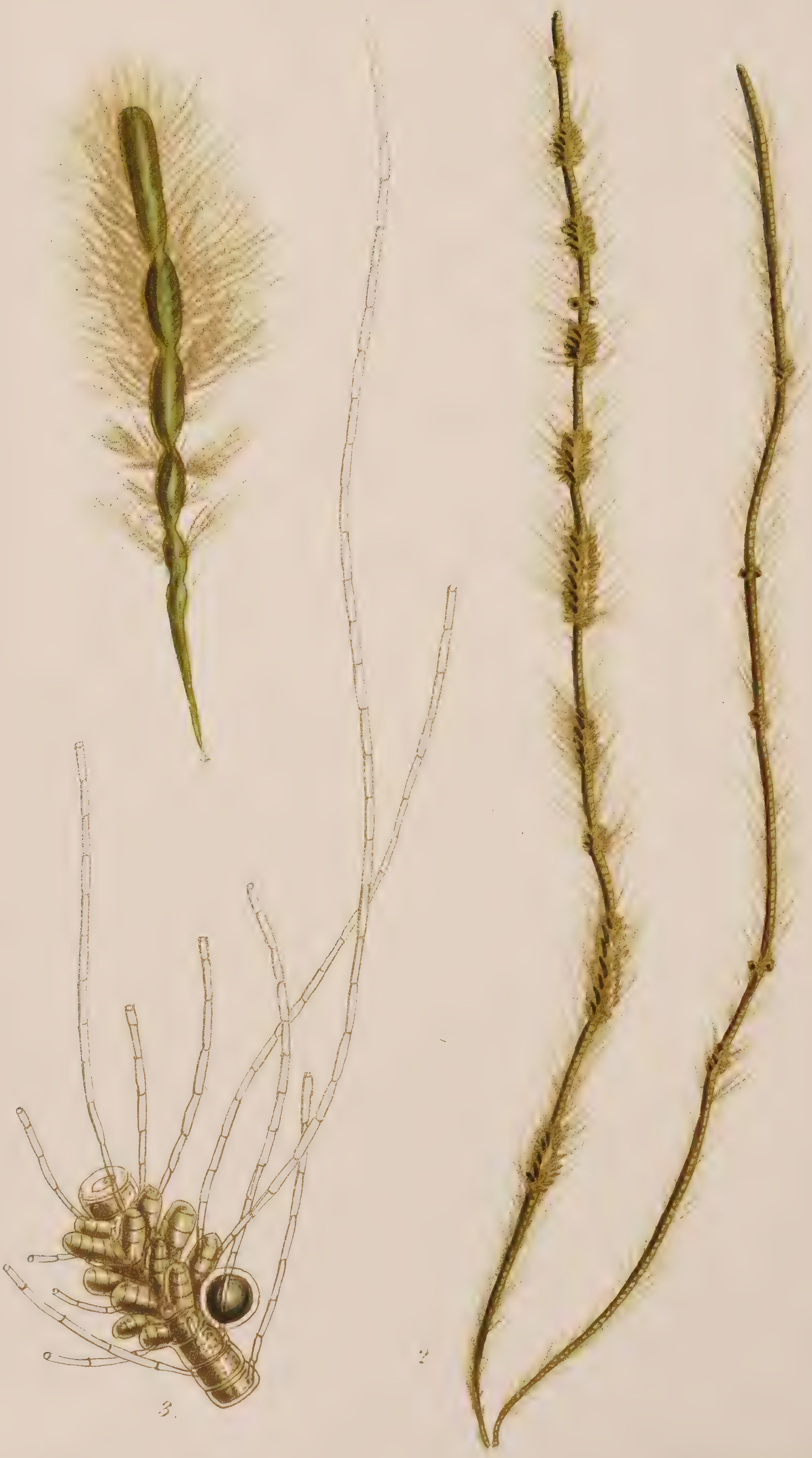

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PLATE CLVI.

MYRIOTRICHIA FILIFORMIS, *Harv.*

GEN. CHAR. *Fronds* capillary, flaccid, jointed, (simple) beset with quadrifarious, simple, spine-like ramuli, clothed with byssoid fibres. *Fructification*; ellipticle *utricles* (or *spores*) containing a dark-coloured mass. MYRIOTRICHIA (*Harv.*),—from μυριος, a *thousand,* and θριξ, a *hair.*

MYRIOTRICHIA *filiformis*; stem filiform, slender, often flexuous or curled, beset at irregular intervals with oblong clusters of short, papillæform ramuli.

MYRIOTRICHIA filiformis, *Harv. Man.* p. 44. *Wyatt, Alg. Danm.* no. 213.

HAB. Parasitical on *Chorda lomentaria,* often accompanying *M. clavæformis.* Annual. Summer. Not uncommon on the English and Irish shores.

GEOGR. DISTR. British Islands.

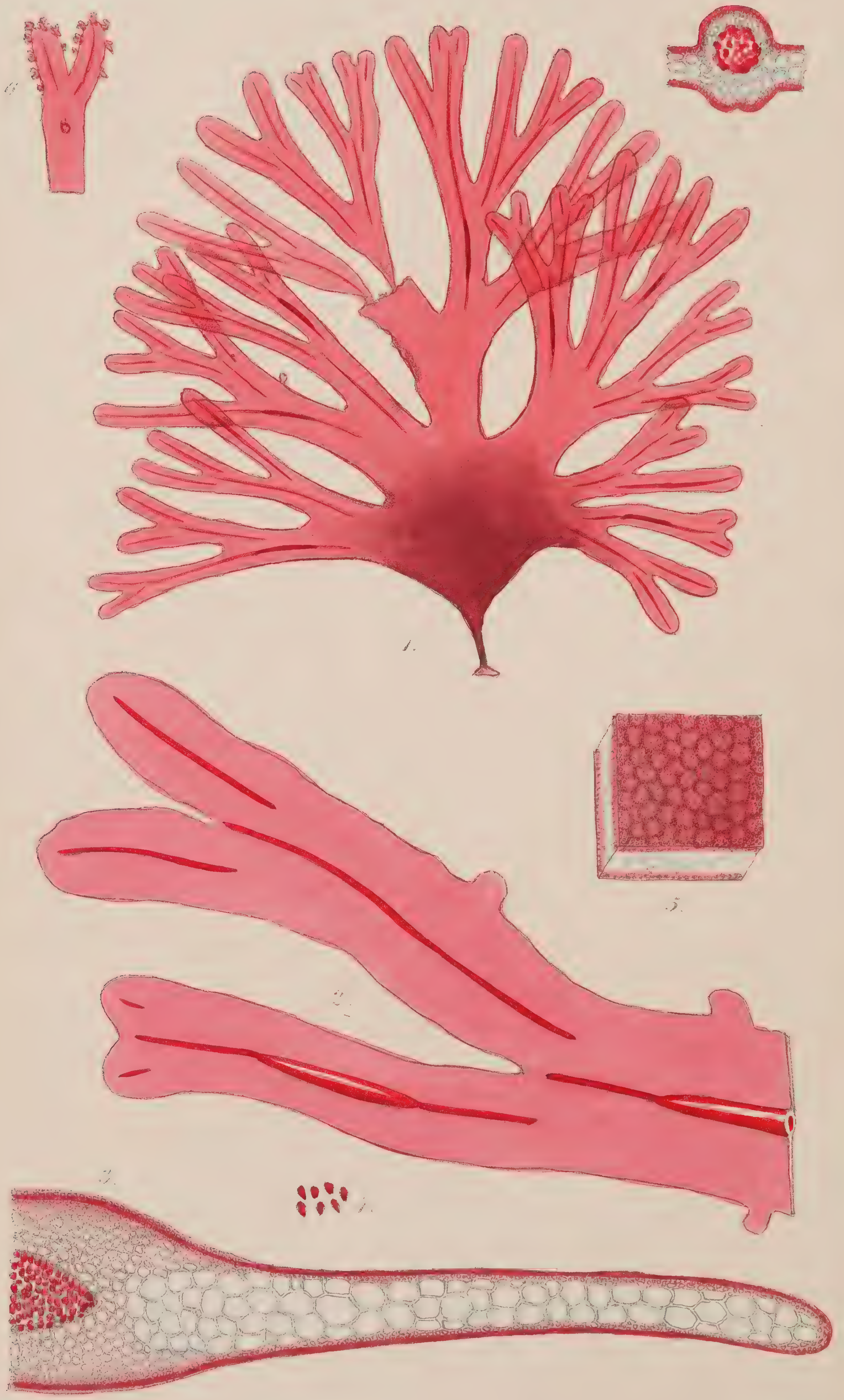
DESCR. *Fronds* an inch or more in length, very slender, densely clothing the fronds of *Chorda lomentaria,* tufted, flexuous, simple, filiform, at intervals appearing thickened or knobbed; the knobbed portions formed of exceedingly dense, short, papillæform ramuli. Both the ramuli and the main stems emit numerous, long, simple, colourless, byssoid fibres. *Articulations* shorter than broad, filled with dense, granular matter. *Spores* spherical, with a hyaline pericarp, variously scattered along the main filament. *Colour* varying from a yellowish olive to a pale brown. *Substance* tender, and more or less gelatinous, closely adhering to paper, and usually glossy when dry.

A comparison of the figure here given, with that of *M. clavæformis* at Plate CI., will best show the differences between these two plants. It will be seen that while in the former the ramuli regularly increase in length from the base upwards so as to give the frond a club-shaped, or very slender pear-shaped outline; in this they preserve nearly an equal length in different parts of the frond, and are collected into oblong clusters, separated by spaces bare of ramuli. In all other respects the two plants closely resemble each other, and as they are frequently found intermixed on the same frond of *Chorda lomentaria,* I formerly regarded the present as merely a state of *M. clavæformis.* The merit of having correctly distinguished these closely allied species is due to Mrs. Griffiths, who first pointed out the peculiar characters of both.

M. filiformis is much the most abundant species, and is, indeed, very generally to be found clothing the *Chorda,* when the latter grows in small shallow pools, exposed to strong sunlight. In such localities almost every frond of *Chorda lomentaria* is converted into a soft, cylindrical brush, from the multitudes of these little parasites, clothed with their gelatinous, transparent hairs, which, while the plant remains in the water, stand out on every side, keeping each little filament free of its neighbour. When drawn into the air, the whole falls together in a gelatinous mass.

In the list of British Algæ given at the conclusion of our first volume, the names *Ectocarpus simplex,* Ag., and *E. villum,* Harv., occur. Since that list was printed I have made a more careful examination of the specimens on which these names were imposed, and fear that both are referable to young states of *M. filiformis.* Never having seen an authentic specimen of Agardh's *E. simplex,* I cannot take it upon me to pronounce his plant to be identical with the Jersey plant so named by me; but judging from the description given by that author, I think it very probable that his plant is the same as ours, and therefore to be regarded as a synonyme of *M. filiformis.* In strict priority, should this opinion be established, the specific name "*simplex*" would belong to our present species, but as this word denotes a character common to the genus, it seems undesirable to adopt it for a species.

Fig. 1. A plant of *Chorda lomentaria* infested with MYRIOTRICHIA FILIFORMIS:—*of the natural size.* 2. Fronds of the latter:—*magnified.* 3. Small portion of a frond—*highly magnified.*



W. H. H. del. et lith.

Reeve, Benham & Reeve, imp.

PLATE CLVII.

STENOGRAMME INTERRUPTA, *Mont.*

GEN. CHAR. *Frond* rose-red, leaf-like, nerveless, laciniate; composed, *internally*, of large, transparent, stratified cells; *externally* of minute, coloured cellules. *Fructification*; 1, linear, convex, longitudinal, (nerve-like) *conceptacles*, containing a dense mass of minute *spores*; 2, *tetraspores* (unknown)? STENOGRAMME (*Harv.*),—from στενος, *narrow*, and γραμμη, a *line*; alluding to the linear fructification.

STENOGRAMME *interrupta*; frond stipitate, membranaceous, flabelliform, more or less deeply laciniate; laciniæ repeatedly dichotomous, their apices obtuse; conceptacles forming a nerve-like line through the centre of each lacinia, and (usually) abruptly terminating opposite the furcation.

STENOGRAMME interrupta, *Mont. in Duchart. Rev. Bot.* 1846. p. 483.

STENOGRAMME europea, *Harv. in Herb.* 1847.

DELESSERIA interrupta, *Ag. Sp. Alg.* vol. i. p. 179. *Ag. Syst.* p. 250. *Mont. in Webb, Ot. Hisp.* p. 15. t. 8. *Endl. 3rd Suppl.* p. 53.

HAB. Among rejectamenta, probably washed up from deep water. Annual? November. Very rare. Bovisand, near Plymouth, *Dr. John Cocks.* Mount Edgecombe, *Rev. W. S. Hore.*

GEOGR. DISTR. Cadiz, *Cabrera.* Plymouth Harbour.

DESCR. *Root*, a small conical disk. *Frond* furnished with a short stem, 3–4 lines long, which soon becomes compressed, and rapidly expands into a fan-shaped membrane, from three to five inches, or perhaps more, in length, and fully as much in breadth. In some specimens the membranous expansion is divided, nearly to its base, into numerous, linear, ribbon-like laciniæ, which are more or less regularly dichotomous, with narrow axils, and rounded tops; in others the laciniated portion extends only a half, or two-thirds the length of the frond, the remainder being undivided; and in others again, the truncated tips of the frond, which have been injured from some cause, throw out proliferous, cuneate, forked leaflets. In all varieties, something of a fastigiate outline is preserved. The margin, which is usually quite flat and very entire, sometimes throws out minute, lobed, and somewhat curled fringing processes. Barren fronds are quite destitute of nerve; *fertile* ones (which are more common) have the centre of each lacinia traversed by a raised, nerve-like line, which commences just below one of the forkings, and terminates nearly opposite to a lower fork: this is the commencement of fructification. It rarely, if ever, happens that the whole of this line proves fertile; usually, small portions varying from one to four lines in length become much thickened, considerably raised, and of a dark-red colour; and these, at maturity, are filled with innumerable, minute spores; sometimes but a very minute portion of the line is transformed, and a *spherical conceptacle* results (fig. 6.). *Substance* cartilagineo-membranous, becoming flaccid, and adhering to paper in drying. *Colour* a fine clear, pinky red, becoming orange in fresh water; darker towards the base, and becoming duller in drying, but preserving a polished surface. The cells of the central portion of the frond are large, and apparently empty, in two or three rows; those of the outer stratum minute, irregularly placed, and full of coloured matter.

This very interesting plant, by far the most important addition which has been made to the British Marine Flora since the commencement of the present work, was discovered on the 21st October, 1847, by Dr. John Cocks of Plymouth, among rejectamenta on the shore at Bovisand. A few days subsequently it was met with in a neighbouring station by the Rev. W. S. Hore, who at the same time gathered the equally rare and curious *Carpomitra Cabreræ*; and to the untiring perseverance of both these gentlemen, who, day by day, during the inclement month of November—in all weathers—visited the shore, and preserved every scrap of these plants which the waves threw up, we are indebted for all the British specimens which have yet been taken of the *Stenogramme*, and for all, except Miss Ball's original one, of the *Carpomitra*. To Dr. Cocks and Mr. Hore, I am anxious to express my obligations for numerous specimens of these rare plants; and to the latter especially, for much important information illustrating the history of the present. It is right to state that Mr. Hore's observation led to my correcting the error into which, following Agardh, I should have fallen, of describing the thickening of the frond, caused by incipient fructification, as a true nerve. Mr. Hore having found a barren specimen in which no such nerve exists, established the truth of his view, which he had previously entertained from other considerations.

The genus *Stenogramme* was originally proposed by me, in the 'Botany of Beechey's Voyage,' for a plant found on the coast of California which strongly resembles the present in habit, and quite agrees with it in structure and fructification. Strange to say, according to a specimen preserved in Bory St. Vincent's Herbarium, *S. Californica* appears to be a native of France also!

English specimens of *S. interrupta* are broader, less regularly, and less deeply divided than the figure of a Spanish specimen given by Montagne; but I am assured by my learned "Confrère en Flore," that he considers the plants to be identical.

Fig. 1. STENOGRAMME INTERRUPTA:—*of the natural size.* 2. Portion:—*slightly magnified.* 3. Vertical cross section of half the breadth of a fertile lacinia. 4. Spores. 5. Magnified view of the surface:—*all magnified.* 6 Portion of a frond with fimbriated margin and *spherical* conceptacle:—*of the natural size.* 7. Section of the same:—*magnified.*

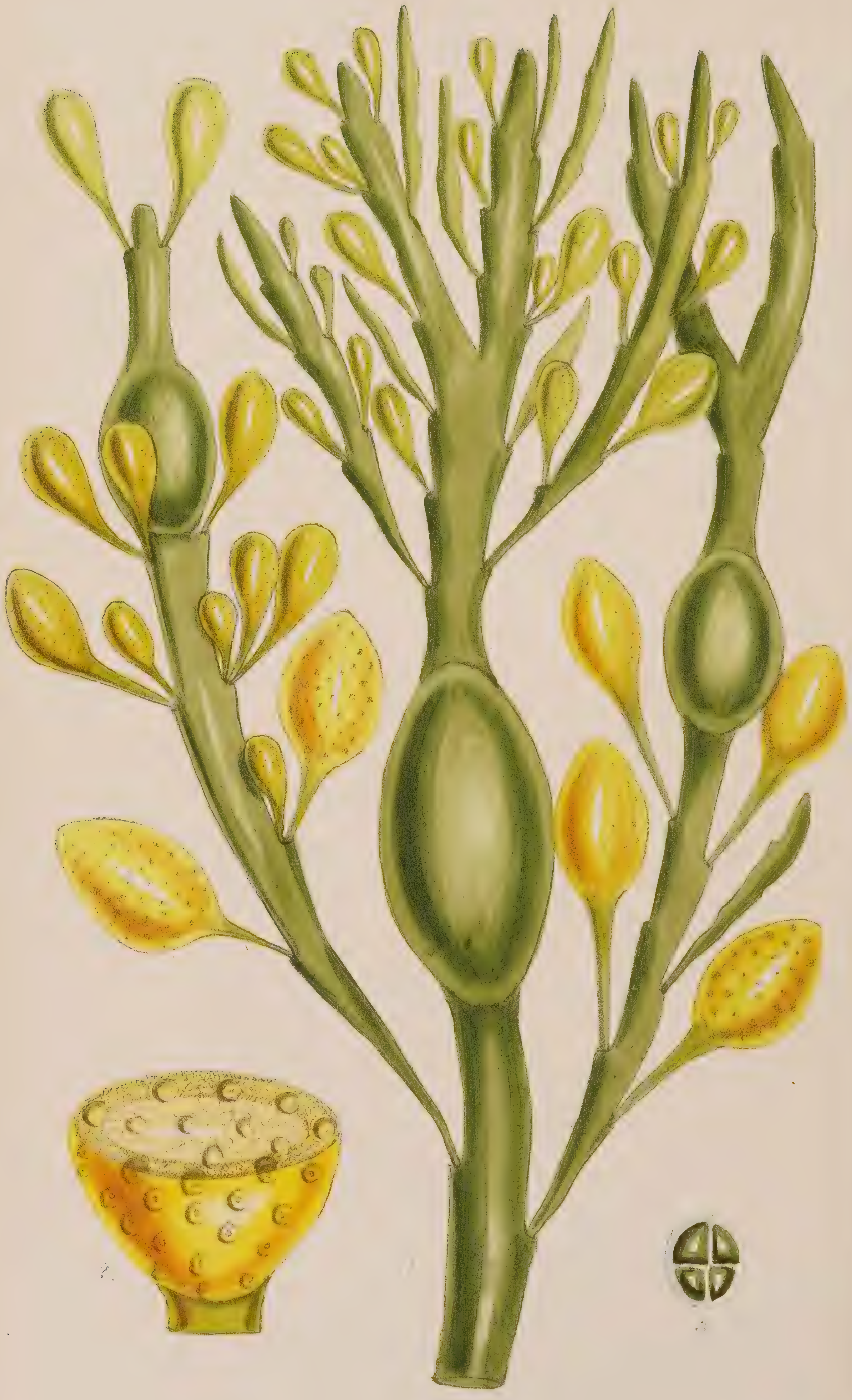

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PLATE CLVIII.

FUCUS NODOSUS, *Linn.*

GEN. CHAR. *Frond* linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels,* when present, innate, simple. *Receptacles* either terminal or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed, spherical *conceptacles,* containing parietal *spores,* or *antheridia,* or both. FUCUS (*L.*),—from φυκος, a *Sea-weed.*

FUCUS *nodosus*; frond compressed, without distinct rib, leathery, subdichotomous; branches strap-shaped, somewhat pinnated, attenuate at base, remotely toothed, here and there swelling into oblong air-vessels; receptacles lateral, ovate, stalked, springing from the axils of the marginal teeth.

FUCUS nodosus, *Linn. Sp. Pl.* p. 1628. *Fl. Suec.* p. 431. *Fl. Lapp.* p. 366. *Lightf. Fl. Scot.* vol. ii. p. 918. *Huds. Fl. Ang.* p. 584. *With.* vol. iv. p. 84. *Stack. Ner. Brit.* p. 35. t. 10. *Fl. Dan.* t. 146. *E. Bot.* t. 570. *Esper,* p. 25. t. 7. and p. 118. t. 60. *Gm. Hist.* t. 1. *B.* f. 1. *Turn. Syn.* p. 252. *Turn. Hist.* t. 91. *Lamour. Ess.* p. 19. *Ag. Sp. Alg.* vol. i. p. 85. *Ag. Syst.* p. 275. *Hook. Fl. Scot.* part. 2. p. 94. *Grev. Fl. Edin.* p. 284. *Spr. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 16. *Hook. Br. Fl.* vol. ii. p. 268. *Wyatt, Alg. Danm.* no. 154. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Endl. 3rd Suppl.* p. 29.

HALIDRYS nodosa, *Lyngb. Hyd. Dan.* p. 37. t. 8.

PHYSOCAULON nodosum, *Kütz. Phyc. Gen.* p. 352.

OZOTHALLIA vulgaris, *Dne. in An. Sc. Nat.* 1845. p. 13.

HAB. Growing on sub-marine rocks and large boulder stones, from ordinary high-water mark to half-tide level. Perennial. Winter and Spring. Very common.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a hard, conical disc, one or two inches in diameter. *Fronds* tufted, from two to four or six feet in length, from a quarter to half an inch or more in width, compressed, two-edged, thickened into an obscure rib in the middle, especially in older parts, linear, once or twice forked at considerable intervals, remotely toothed at the margin. From the axils of the teeth spring lateral, distichous branches similar to the main frond, toothed and again once or twice pinnated with smaller branches, which are either simple and lanceolate or cuneate and forked; or furnished, in place of branchlets, with solitary or tufted receptacles. All the divisions of the frond are very much attenuated at base, and more or less acute at the apex. *Vesicles* one to two inches long, oval-oblong, formed at intervals in the principal stem and branches; rarely absent. *Receptacles* springing from the axils of the marginal teeth, ovate, raised on slender stalks, from half an inch to upwards of an inch in length, bright yellow when ripe, two or more often issuing from the same point. These contain, in some individuals, *antheridia*, affixed to branching threads; in others, globose spores, which at length separate into four sporules. *Substance* exceedingly tough and leathery. *Colour* a dull, olive-green; which becomes black in drying.

This is the largest of the British species of the restricted genus *Fucus,* and by far the toughest and most rigid. Its substance is thicker and denser than that of any of the others, and its frequently pinnated habit, and remarkably large vesicles, added to the ribless frond, afford strong marks of distinction. When in fructification, the great abundance of the clear yellow receptacles contrasts agreeably with the colour of the other parts of the frond. Like most other submersed plants this varies in luxuriance according to the depth at which it grows: specimens near high-water mark being short and bushy, often exceedingly crowded in branches, and thickly covered with fruit; while those produced near ordinary low-water are drawn out to a great length, with more distant branches. The older authors founded varieties, which are scarcely worth noticing, on these differences.

Fucus nodosus is almost always more or less infested with *Polysiphonia fastigiata,* which forms globose tufts of a rich brown colour on various parts of its fronds. This parasite is not confined to the present species, however, but may often be seen on old stumps of *F. vesiculosus,* to which it generally attaches itself near the root only.

F. nodosus is one of those largely used in the manufacture of Kelp, which it yields in considerable quantities. Oystermen sometimes employ it to cover their oysters, though *F. serratus* is more generally employed for that purpose. In Scotland this plant is called *Sea-Whistles*; and boys make whistles of the larger air-vessels, according to Lightfoot, by cutting them across near one end.

Fig. 1. FUCUS NODOSUS; portion of a frond—*of the natural size.* 2. Segment of a receptacle:—*slightly magnified.* 3. A spore:—*highly magnified.*

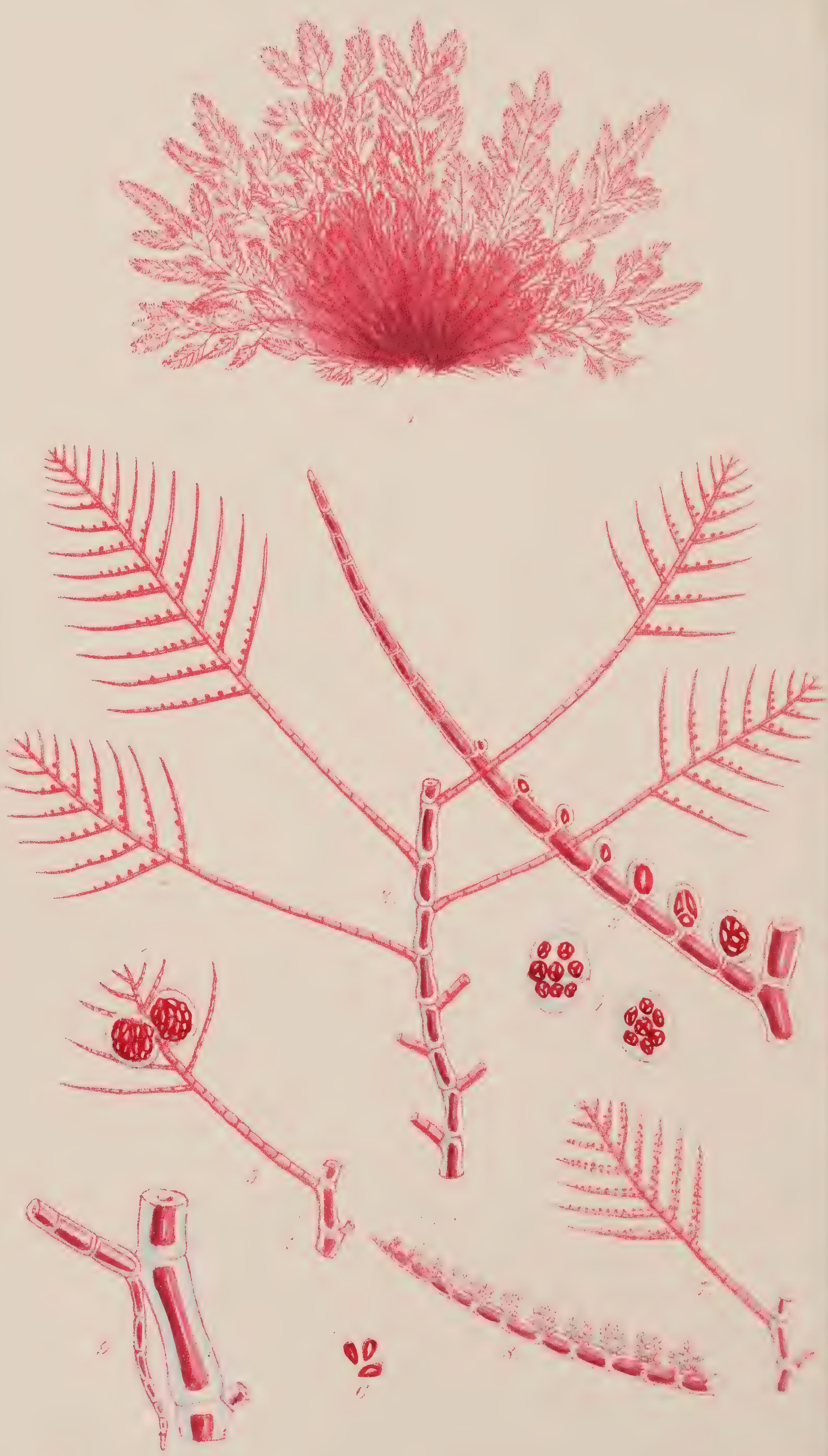


PLATE CLIX.

CALLITHAMNION BORRERI, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλὸς*, *beautiful*, and *θαμνιον*, a *little shrub.*

CALLITHAMNION *Borreri*; much branched, sub-distichous, rigid or flaccid; branches set with distichous plumules which are bare of ramuli in their lower half, and simply pinnate in their upper; pinnæ long, patent, subulate, simple (or ramulose at top), the lowermost longest; articulations of the branches 2–5 times, of the pinnæ about twice as long as broad; tetraspores roundish, sessile on the inner face of the pinnæ; favellæ two-lobed, near the apex of the lesser branches.

CALLITHAMNION Borreri, *Ag. Sp. Alg.* vol. ii. p. 170. *Harv. in Hook. Br. Fl.* vol. ii. p. 344. *Harv. Man.* p. 110. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 372.

CALLITHAMNION seminudum, *Ag. Bot. Zeit.* 1827. p. 637. *Ag. Sp. Alg.* vol. ii. p. 167. *Harv. in Hook. Br. Fl.* vol. ii. p. 344. *Wyatt, Alg. Danm.* no. 187. *J. Ag. Alg. Medit.* p. 72. *Endl. 3rd Suppl.* p. 34.

CERAMIUM pinnulatum, *Ag. Syst.* p. 139.

CERAMIUM miniatum, *Ag. Syst.* p. 141.

CONFERVA Borreri, *Sm. E. Bot.* t. 1741.

HAB. On mud-covered rocks near low-water mark. Annual. Summer. Rather rare. Yarmouth, *Mr. Borrer.* Torquay, *Mrs. Griffiths.* Sidmouth, *Miss Cutler.* Ilfracombe, Land's End, and Swansea, *Mr. Ralfs.* Falmouth, *Miss Warren.* Remarkably fine at Plymouth, *Rev. W. S. Hore, Mr. Rohloff,* and *Dr. Cocks.* Clontarf, *Miss Ball.* Howth, *Miss Gower.*

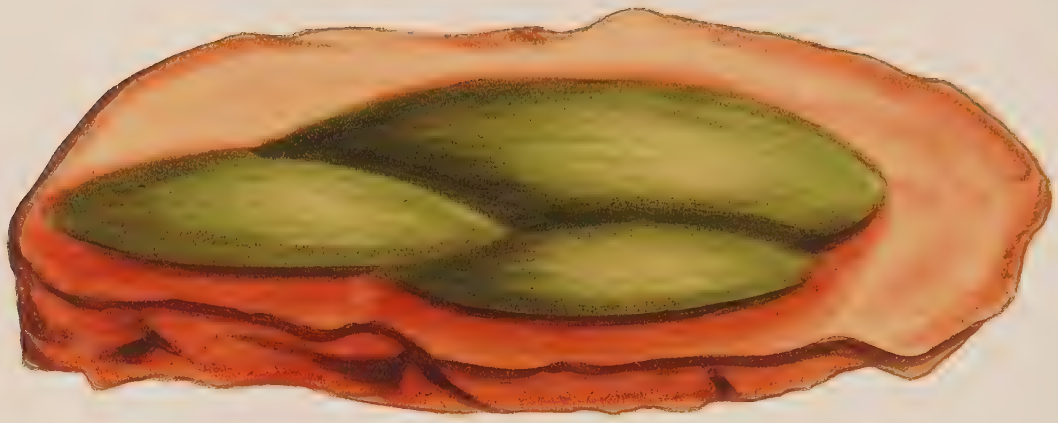
GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas.

DESCR. *Fronds* densely tufted, from one to four or five inches in height, the larger specimens excessively branched, capillary, many times divided in an alternately pinnate manner; branches more or less distichous, long, clothed with three or four series of lesser branches, the last of which are set with alternate, distichous plumules, from a quarter to nearly half an inch in length. *Plumules* issuing at almost every joint, alternate, patent, slender, naked in the lower part to a point beyond their middle; the upper half pinnate, a pinna issuing from every joint. *Pinnæ* alternate, subulate, the lowest longest, the rest gradually shorter to the apex. On luxuriant specimens I have frequently observed slender, root-like fibres to issue from the lowest joint of a plumule (fig. 9). *Articulations* of the stem from three to five times longer than broad, with a wide limbus, and narrow bag of endochrome, destitute of veins: articulations of the lesser branches and ramuli about twice as long as broad. *Tetraspores* roundish, sessile on the inner face of the pinnæ, one or several on each pinna; sometimes containing *eight* grains, each of which at maturity separates into four pieces (and becomes a tetraspore! [fig. 4]). On some individuals the place of tetraspores is supplied by clusters of hyaline cells, collected in dichotomous threads, which are supposed to be *antheridia* (fig. 7, 8). *Favellæ* (fig. 5) two-lobed, containing many large grains. *Colour*, a fine deep lake, or rosy-red, brownish toward the base: staining fresh water carmine. *Substance* rather rigid when fresh, soon becoming flaccid, and closely adhering to paper.

This very handsome species, whose essential character consists in having the lower half of its plumules bare of ramuli, while the upper is pinnated, the pinnæ spreading like the rays of a fan, was first discovered, about forty years ago, by Mr. Borrer of Henfield, who has added so much to our knowledge of British Botany, and whose zeal in the pursuit of his favourite science is still as ardent as ever. This, one of his early discoveries in a tribe of plants which he very successfully studied, has been consecrated to his honour by Sir James E. Smith.

It is nearly related to several other species, especially to *C. roseum*, *C. polyspermum*, and *C. tripinnatum;* from the two former of which it is known by the shape of its plumules, from the latter, chiefly by the absence of the axillary ramulus. Unlike as, at first sight, this plant may appear to *C. gracillimum*, very luxuriant specimens closely resemble that species in habit, and exhibit a nearer approach in microscopic character than could be supposed. I unhesitatingly refer Agardh's *C. seminudum*, which I have received from that author himself, as well as from several other continental friends, to our *Borreri*: they are undistinguishable. The noblest specimens of this species which I have seen, are those sent to me by my kind friends at Plymouth, to whose liberality I am indebted for a bounteous supply. On some of these I have observed, (and Mrs. Griffiths has, independently, made the same observation,) that the *tetraspores*, so called, contain *eight* sporules, and that each of these at maturity becomes a *tetrasporule*! On other individuals from the same locality we find the place of tetraspores supplied by those little tufts of glassy cells which, in this genus, obtain the name of *antheridia*.

Fig. 1. Callithamnion Borreri:—*of the natural size*. 2. Part of a branch with plumules. 3. A pinna with tetraspores. 4. Compound tetraspores. 5. A ramulus with favella. 6. Spores from the same. 7. A plumule with antheridia. 8. Pinna of the same. 9. Joints of a main branch, with radicular process:—*all more or less magnified*.



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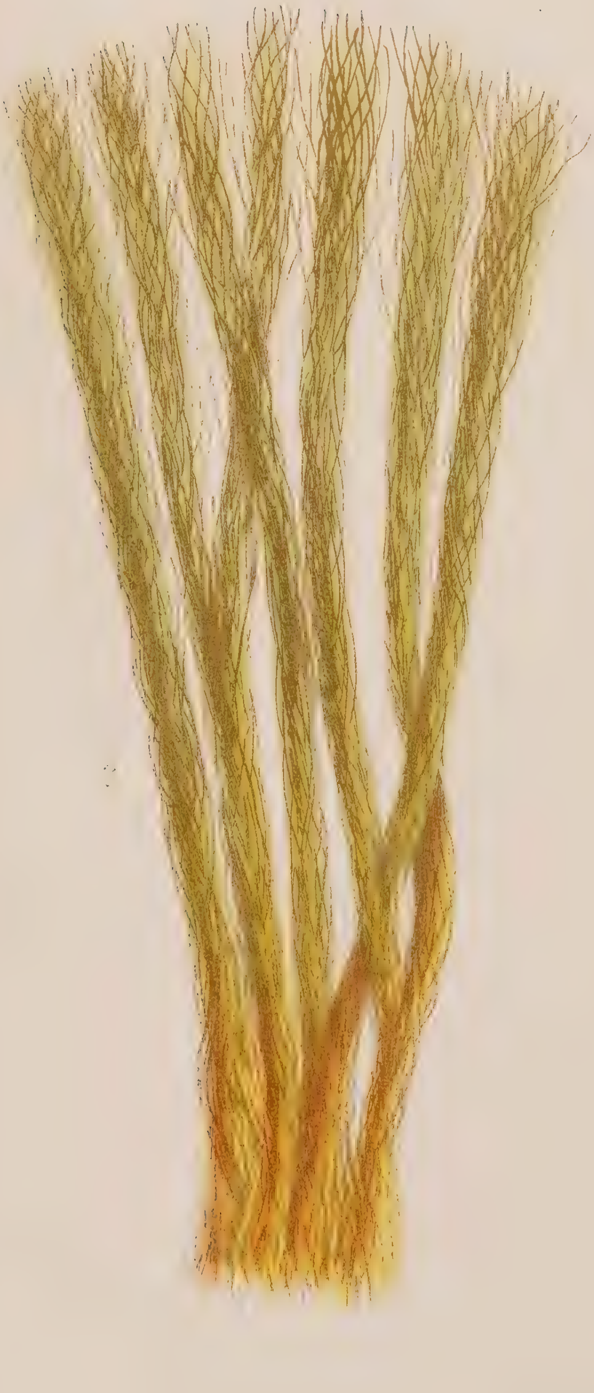

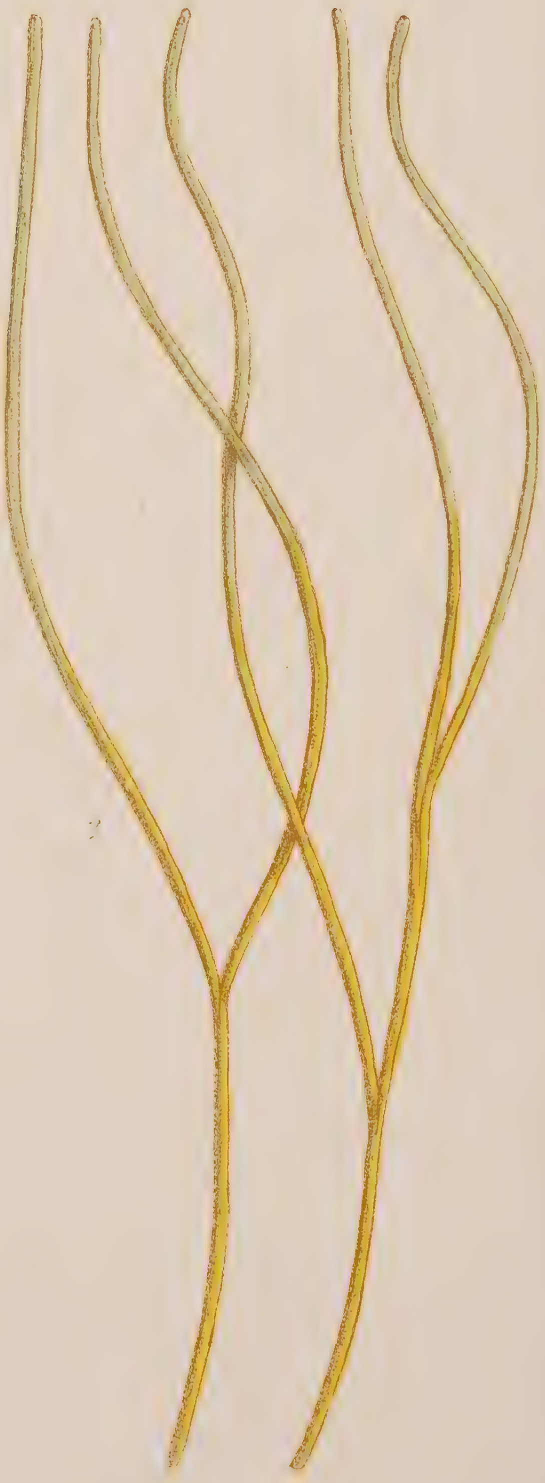

W H H del et lith

Reeve Benham & Reeve, imp

PLATE CLX.

SCHIZOTHRIX CRESSWELLII, *Harv.*

GEN. CHAR. "*Filaments* involved in a thick, lamellar sheath, rigid, curled, thickened at the base, at length longitudinally divided. *Spermatia* lateral." *Kütz.* SCHIZOTHRIX (*Kütz.*),—from σχιζω, to *divide*, and θριξ, a *hair*: *hair-splitter.*

SCHIZOTHRIX *Cresswellii*; forming dense, soft, pulvinate, convex tufts; filaments very slender, curved, fastigiate, collected into branching bundles.

SCHIZOTHRIX Cresswellii, *Harv. in Herb.* (1846.)

CALOTHRIX Cresswellii, *Harv. Phyc. Brit. sub Tab.* 76 *in not.*

HAB. On sandstone maritime rocks, near high-water mark, exposed to the drip of fresh water. Annual. Winter. Near the Picket rock, Sidmouth, *Rev. R. Cresswell.*

GEOGR. DISTR. South coast of England.

DESCR. *Spreading* over the surface of soft sandstone rocks, in continuous, convex, roundish or oval patches, which run one into another, and cover the rock for spaces several inches in diameter, in a more or less regular manner. *Patches* or tufts one or two inches long, half an inch high (or thick), soft, somewhat slimy, composed of very slender, yellowish or greenish-olive, hyaline filaments, collected into dense, rope-like, branching bundles. *Bundles* fastigiate. *Filaments* exceedingly slender, once or twice divided in a dichotomous manner, apparently by a splitting of the original tube or cell. *Substance* soft, closely adhering to paper, but not glossy when dry. *Colour*, a greenish olive.

In the remarks under Plate LXXVI. of the first volume, I mentioned that I had received from the Rev. R. Cresswell of Salcombe Regis, what I regarded as a new species of *Calothrix*, and proposed to dedicate it to him by the name *Cresswellii.* On communicating a specimen, shortly afterwards, to Professor Kützing, I was informed by that author that it belonged to his recently instituted genus *Schizothrix*, of which it appeared to be a new and very distinct species. This genus is closely related to *Calothrix*, from which it differs chiefly in the mode of increase of its filaments, which divide at maturity in a dichotomous manner. I am not very sure, however, that there may not be some optical delusion in this matter, and offer the third figure in the plate with some hesitation. In habit this plant bears considerable resemblance to one of the larger species of *Rivularia*, especially to some of the fresh-water kinds, or those that inhabit dripping rocks: localities very similar to what our *Schizothrix* delights in. But the nature of its filaments, the absence of the basal globule, and of the firm gelatinous matrix, afford sufficient characters to separate it from any of the *Rivulariæ*.

Mr. Cresswell states that the *Schizothrix* grows at the very top of high-water mark, in situations where it is exposed to the continual drip of fresh water falling from high mural cliffs, and that it is most luxuriant where the drip falls from the greatest height, which in the station observed is about fifty feet. In this locality, where only this curious plant has yet been found, it occurs in considerable quantity, extending for upwards of twenty yards along the surface of a projecting piece of the cliff. It commences to grow late in the autumn, and is in perfection in November.

I have peculiar pleasure in dedicating this species to its discoverer, who has explored with much zeal and ability the botany of his neighbourhood, not omitting the more minute Algæ, which too commonly escape the notice of mere *collectors*. I am indebted to him for many specimens of the rarer kinds, and for excellent observations on several of them; and we may anticipate much interesting information from experiments which he has commenced on the growth of Sea-weeds, in closed bottles of sea-water. Already, he writes in a recent letter, he has succeeded perfectly with *Bryopsis plumosa*, which, in the space of a month, "has grown considerably, and is now putting out beautiful side branches." This subject deserves more attention. I may mention that I have myself a plant of *Griffithsia setacea*, inclosed in April 1846, which is now (Feb. 1848) in perfect health; that the water in the bottle has never been changed, and is as pure as when the plant was inclosed in it. No care has been taken of this plant, which stands on a library shelf.

Fig. 1. Schizothrix Cresswellii; tufts, *in situ*:—*of the natural size*. 2. Bundles of filaments:—*magnified*. 3. Portion of two filaments:—*highly magnified*.

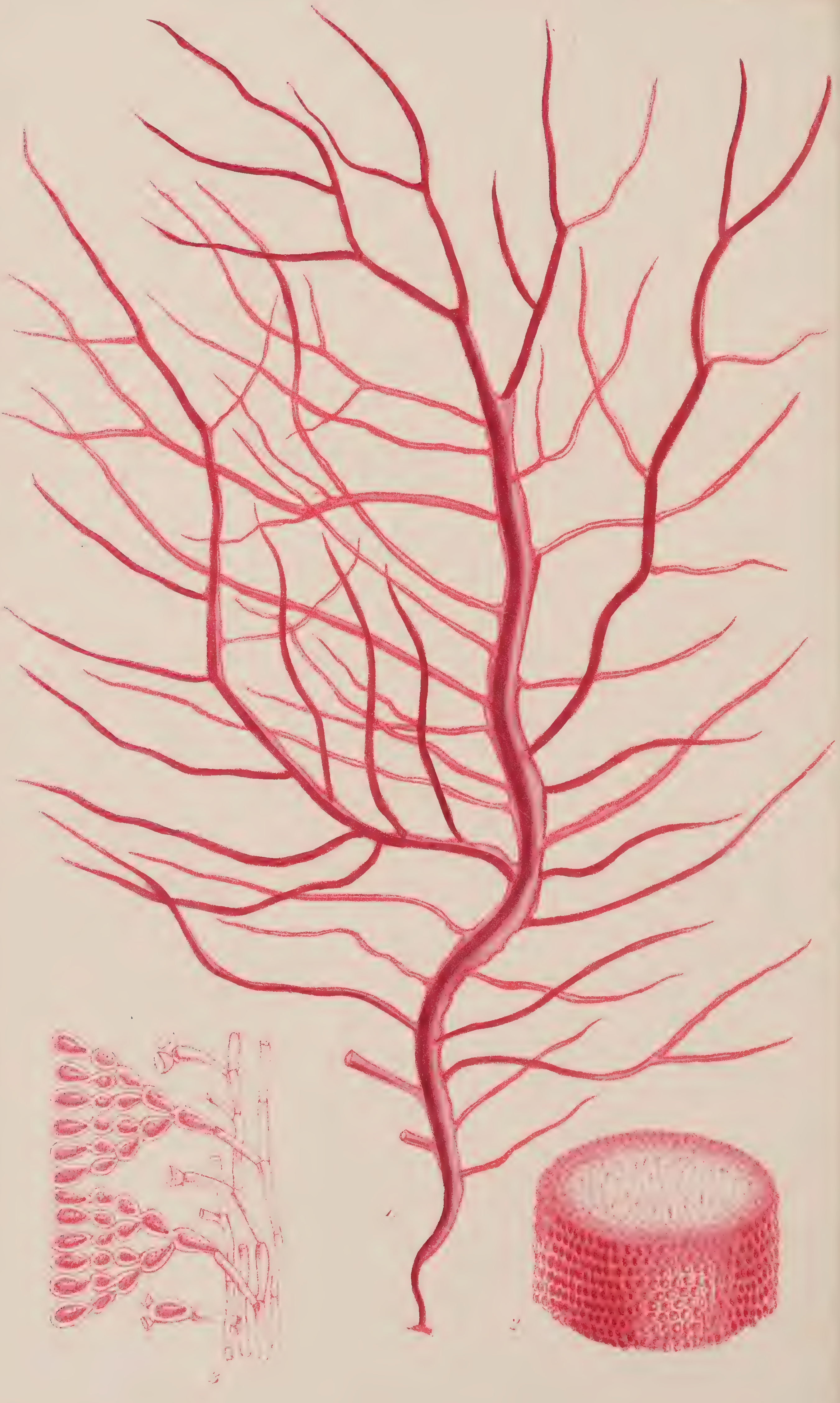
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PLATE CLXI.

NEMALEON? PURPUREUM, *Chauv.*

GEN. CHAR. *Fronds* cylindrical, gelatinoso-cartilaginous, elastic, solid; *axis* columnar, dense, composed of closely-packed, longitudinal, interlaced filaments; the *periphery* of elongated, horizontal, dichotomous filaments, whose ultimate ramuli are moniliform and coloured. *Fructification*; globular masses of spores (*favellidia*), attached to the filaments of the periphery. NEMALEON (*Tozzetti*),—from νημα, a *thread*, and ληιον, a *crop: crop of threads.*

NEMALEON *purpureum*; stem undivided, attenuated at base and apex, set with numerous, irregularly inserted, elongated, simple, tapering branches, which are either naked, or furnished with a second series of similar branches.

NEMALEON purpureum, *Chauv. mem.* p. 57.

MESOGLOIA purpurea, *Harv. in Hook. Br. Fl.* vol. ii. p. 386. *Harv. Man.* p. 48. *Wyatt, Alg. Danm.* no. 47.

DUMONTIA Calvadosii, *Lamour. Dict. D'Hist. Nat.* vol. v. p. 643. *Gaill. Dict. Sc. Nat.* vol. 53. p. 364. *Duby, Bot. Gall.* p. 941.

HAB. In sandy places, among *Zostera,* near low-water mark. Annual. Summer. Rare. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler.* Whitsand Bay, *Rev. W. S. Hore.* Kilkee and Miltown Malbay, *W. H. H.* Balbriggan, *Miss Gower.*

GEOGR. DISTR. Atlantic coasts of France.

DESCR. *Root,* a minute, conical disc. *Frond* from eight inches to two feet or more in length, slender at the base, gradually widening to a diameter of two to three lines in the middle, and thence gradually tapering upwards into a long, slender point, mostly undivided, or sometimes forked or trifurcate at the extremity, set throughout its length with alternate or opposite irregularly inserted lateral branches. *Branches* closely placed, patent, constricted at base, flexuous, very long, drawn out into a long, slender point, generally quite naked, or, in large specimens, furnished with a second series of smaller and more slender branches. All the apices much attenuated and acute. The *axis* is composed of rather laxly interwoven, colourless, branching, longitudinal threads, which throw out on all sides to the circumference, horizontal, dichotomous, coloured, moniliform filaments, with elliptical or pyriform joints. Under the microscope, the branches appear as if thickly studded with convex, coloured cells, (the apices of the filaments of the periphery,) separated by pellucid spaces. *Colour* varying from a fine deep purple red to a dull pink, rapidly given out in fresh water, and becoming browner in drying. *Substance* tender, gelatinous, and slippery, but not very elastic. *Fructification* (imperfectly known), consisting of masses of spores, seated among the filaments of the periphery.

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M. Chauvin of Caen, in his excellent "*Recherches,*"* gives a
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history of this plant, from which it appears that it was known to the naturalists of France under the name of *Dumontia Calvadosii*, long before it was noticed on the shores of the British Islands. I was not aware of this fact, when, in 1832, I described, under the name of *Mesogloia purpurea*, specimens which were collected by Mrs. Griffiths, in the autumn of 1828, at Sidmouth. The resemblance to *Dumontia* is only an outward one; the structure is completely that of the *Gloiocladieæ*, and not very unlike that of *Mesogloia vermicularis*, though, according to our present systematic arrangement, these plants belong to different genera, and even to different families. In altering the genus of this plant, M. Chauvin had the option of restoring the specific name under which it was first described, but he has not thought fit to do so.

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* RECHERCHES sur l'organization, la fructification, et la classification de plusieurs genres d'Algues, avec la description de quelques espèces inédites ou peu connues.—*Caen,* 1842.

The *structure* of this species differs considerably from that of *N. multifidum* (already figured at Plate XXXVI.), and probably may justify the future formation of a genus, when the fructification of both plants shall be more perfectly known. In our *N. purpureum*, the axis is composed of much more laxly set filaments; while those of the periphery are less branched, shorter, and composed of very large, pear-shaped cells. Seen under a lens of low power, the branches appear like tubes of glass, densely covered with brilliant purple studs.

Nemaleon purpureum is a rare species on the British shores, though occasionally thrown up in considerable quantities. This occurred at Sidmouth when Mrs. Griffiths first found the plant, but for several succeeding years it did not make its appearance. The specimens then collected were also of a much brighter colour, as well as larger and more luxuriant, than any which have been sent to me from other stations, or than I have myself gathered. I once found it growing on sandy ground near low-water mark; but it is more usually seen among rejectamenta after a gale.

Fig. 1. NEMALEON? PURPUREUM:—*of the natural size.* 2. Portion of a branch:—*moderately magnified.* 3. Some of the filaments, composing the same:—*highly magnified.*

Plate CLXII.

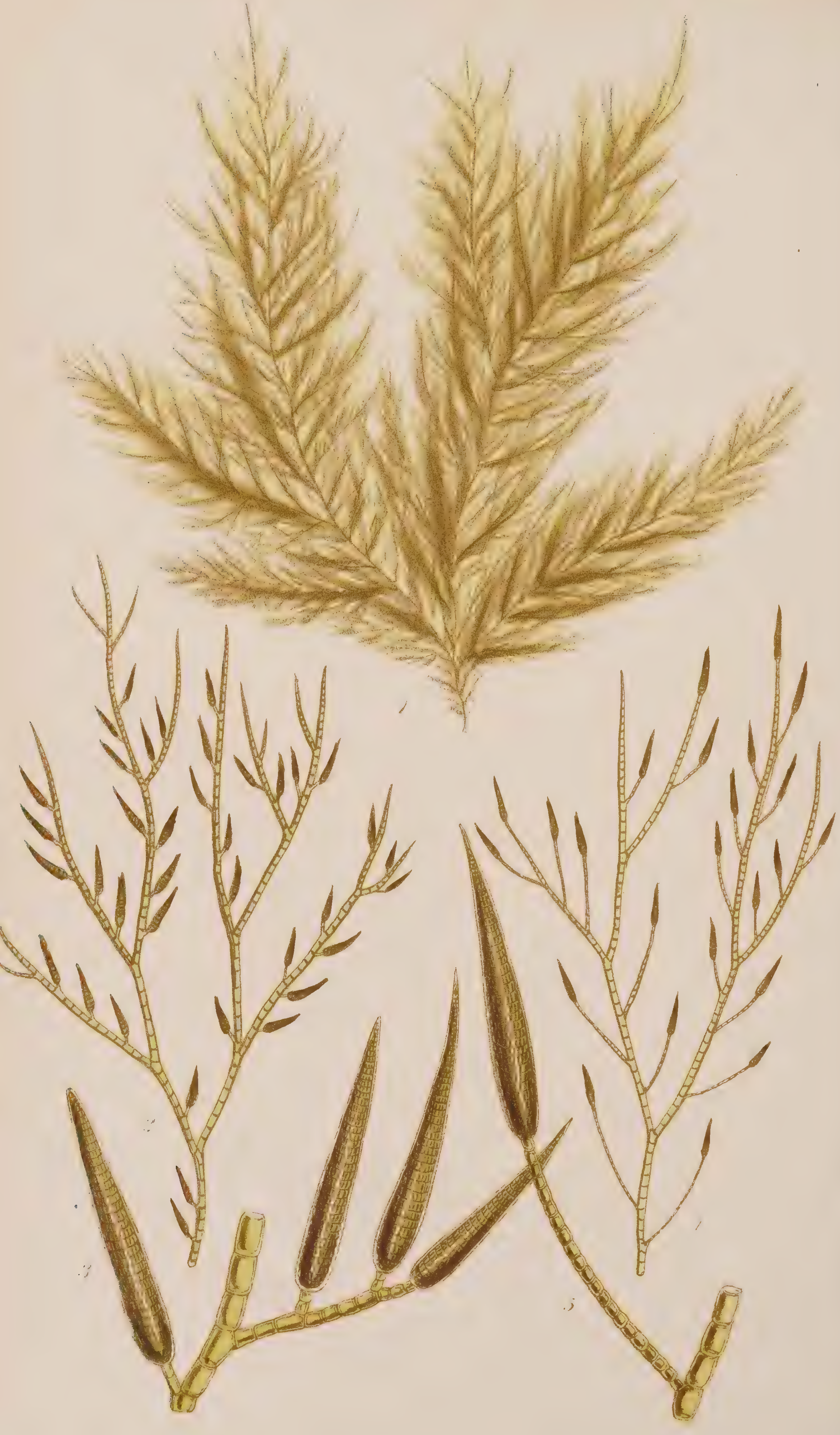

PLATE CLXII.

ECTOCARPUS SILICULOSUS,* *Lyngb.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*), borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from εκτος, *external,* and καρπος, *fruit.*

ECTOCARPUS *siliculosus;* tufts yellowish or pale olive green, gelatinous, soft; filaments very slender, excessively branched; ultimate branchlets alternate or secund, attenuated; utricles stalked, subulate, attenuated to a fine point.

ECTOCARPUS siliculosus, *Lyngb. Hyd. Dan.* p. 131. t. 43. *Ag. Syst.* p. 161. *Grev. Fl. Edin.* p. 314. *Ag. Sp. Alg.* vol. ii. p. 37. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 40. *Wyatt, Alg. Danm.* no. 172. *J. Ag. Alg. Medit.* p. 26. *Endl. 3rd Suppl.* 21. *Kütz. Phyc. Gen.* p. 288.

CERAMIUM siliculosum, *Ag. Syn.* p. 65. *Hook. Fl. Scot.* part 2. p. 86.

CERAMIUM confervoides, *Roth, Cat.* vol. i. p. 151. t. 8. f. 3. and vol. iii. p. 148.

CONFERVA siliculosa, *Dillw. Syn.* no. 112. t. E. *Sm. Eng. Bot.* t. 2319.

β. *longipes;* stalks of the utricles very long.

HAB. Parasitical on various marine Algæ, between tide marks, and in three to four fathom water. Annual. Spring to Autumn. Very common. β. at Jersey, *Miss White.*

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea.

DESCR. *Filaments* from three to eighteen inches long, densely tufted and excessively branched, very slender, the main branches more or less entangled together, in old specimens especially, into slender rope-like bundles, the lesser branches free, spreading on all sides, long, and set with feathery branchlets furnished with lateral byssoid ramuli. *Branches* and *ramuli* alternate, or subsecund, issuing at acute angles; the latter long, and tapering to a point. *Joints* from once and a half to twice as long as broad, pellucid. *Utricles* broadly subulate, or somewhat lanceolate, closely transversely striate, tapering to a fine point, and occasionally produced at the apex into a hyaline filament. In our var. β. (fig. 4, 5.) the utricles are borne on very long stalks, but not otherwise different. *Substance* very soft, somewhat gelatinous, soon decomposing, closely adhering to paper in drying; sometimes more harsh and coarser. *Colour* varying from olive green to yellowish or brown.

* * *

This is one of the commonest species of *Ectocarpus* in the waters of Europe, and is more generally dispersed than most others of the genus. Formerly it was confounded with *E. littoralis*, and is still, by many botanists, regarded as merely a state of that species. The branching and general habit of the two plants are very similar. *E. siliculosus* is, however, usually more slender, more gelatinous, softer, and more feathery in its ramification. A more absolute distinction lies in the difference of the *fruit*, which is here a lanceolate pod, while in *E. littoralis* one or more spores are immersed in the branches, where they sometimes form strings. Those who regard the two plants as states of one species, affirm that the pod-like fruit of the present is merely a *secondary* fruit, proving nothing. This view, after as careful consideration as I can give the subject, I am not disposed to adopt, at least, not until some more convincing arguments shall be brought forward, than its advocates have yet offered.

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* Erroneously printed *reticulosus,* in the list given at the end of our first volume.

The specimen of which a magnified portion is represented at fig. 5, and on which our var. β is founded, was sent to me from Jersey by Miss White. In its general aspect and in ramification, it resembles the common *E. siliculosus*, but is remarkable for having its pods raised on very long peduncles, or, in other words, terminating the branches and ramuli. I am not aware that this variety has been previously noticed, nor have I seen a second specimen of it. Whether it be one of the one hundred and thirty new species of *Ectocarpus* which, I am informed, Prof. Meneghini has proposed, I am unable to say, not having received the Fifth Part of that author's work.

Fig. 1. ECTOCARPUS SILICULOSUS :—*of the natural size.* 2. A branch of var. *a.* 3. Utricles from the same. 4. A branch of var. β. 5. Utricle from the same :—*all more or less highly magnified.*

Plate CLXIII.

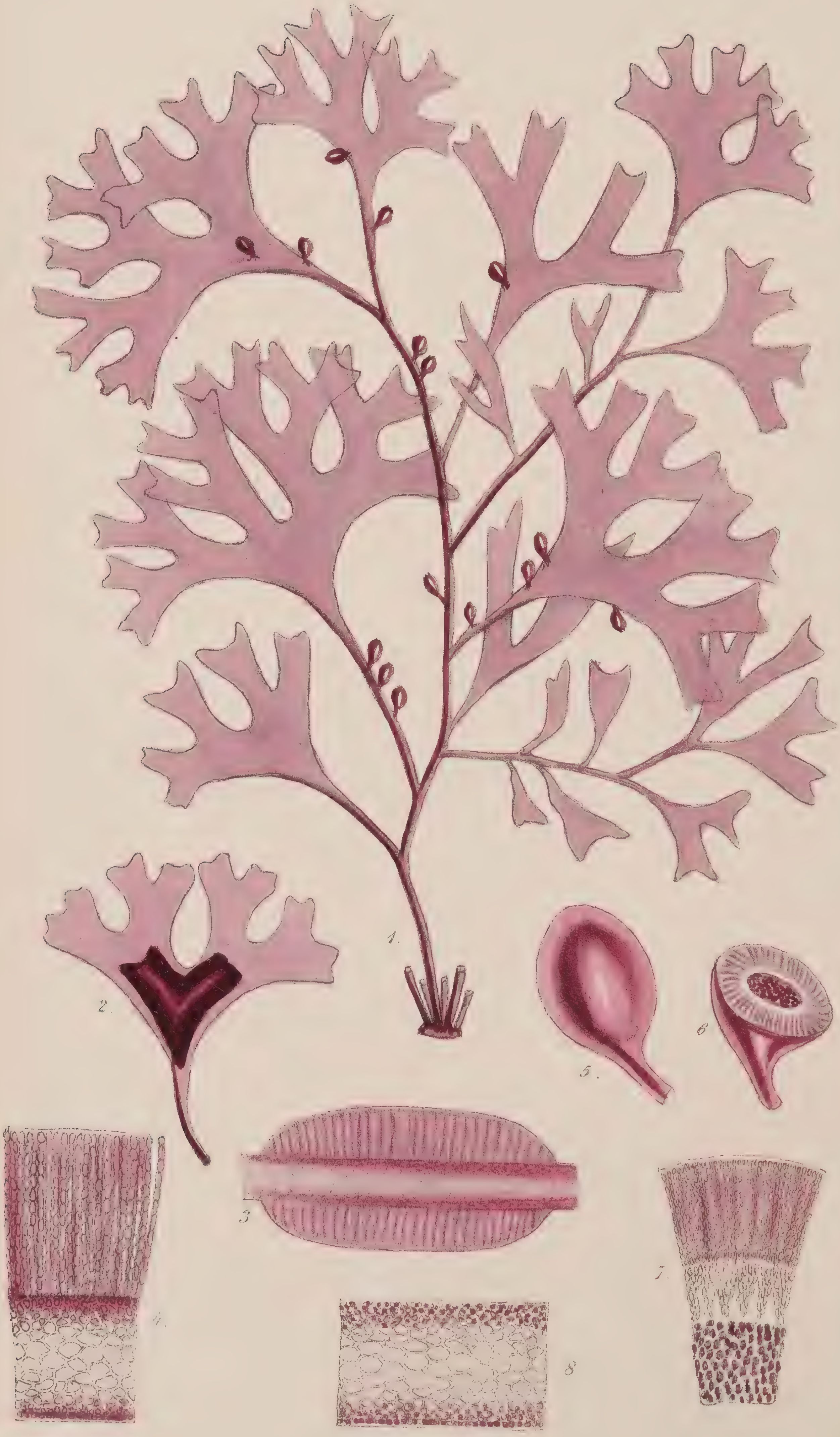

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Plate CLXIII.

PHYLLOPHORA MEMBRANIFOLIA, *J. Ag.*

Gen. Char. *Fronds* stipitate, rigid-membranaceous, proliferous, nerveless, or with a vanishing nerve, cellular; cells minute, angular, gradually smaller towards the surface. *Fructification*; 1, *tubercles* (*favellidia*) scattered over the frond, containing masses of minute spores; 2, *warts* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length converted into spores? 3, *tetraspores* (on distinct plants) collected into sori, either towards the apex of the frond, or in proper leaflets. Phyllophora (*Grev.*),—*φυλλον*, a *leaf*, and *φορεω*, to *bear*.

Phyllophora *membranifolia*; stem cylindrical, filiform, branched; the branches expanding into broadly wedge-shaped, two-lobed or dichotomous segments; tubercles oval, on short stalks arising from the stem or leaflets; nematheeia forming broad patches in the centre of the leaflets.

Phyllophora membranifolia, *J. Ag. Alg. Medit.* p. 93. *Endl. 3rd Suppl.* p. 38.

Rhodymenia membranifolia, *Harv. in Phyc. Br. Syst. list*, p. xii.

Chondrus membranifolius, *Grev. Alg. Brit.* p. 131. *Hook. Br. Fl.* vol. ii. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 202. *Wyatt, Alg. Danm.* no. 76. *Harv. Man.* p. 78.

Sphærococcus membranifolius, *Ag. Syn.* p. 26. *Lyngb. Hyd. Dan.* p. 10. t. 3. *Ag. Sp. Alg.* vol. i. p. 240. *Ag. Syst.* p. 214. *Hook. Fl. Scot.* part 2. p. 102. *Grev. Fl. Edin.* p. 295. *Spreng. Syst. Veg.* vol. iv. p. 335.

Fucus membranifolius, *Good. and Woodw. Lin. Trans.* vol. iii. p. 120. t. 16. f. 1. *Lam. Diss.* t. 20, 21. f. 3. *Turn. Syn.* p. 25. *Turn. Hist.* t. 74. *Sm. E. Bot.* t. 1965. *Stack. Ner. Brit.* t. 20.

Fucus fimbriatus, *Huds. Fl. Angl.* p. 574.

Hab. On rocks and stones, between tide-marks. Perennial. Winter. Very common on the British coasts.

Geogr. Distr. Atlantic shores of Europe and North America.

Descr. *Root* a spreading callus. *Fronds* densely tufted, from three to twelve inches in height. *Stem* slender, as thick as small twine, rigid, cylindrical, repeatedly branched in an irregularly dichotomous manner; branches simple, or bifid, one, two, or more inches in length, spreading, gradually becoming compressed upwards, and expanding into a wedge-shaped, or fan-shaped, more or less divided frondlet. *Frondlets* rigid-membranous, repeatedly dichotomous, the axils and apices obtuse, the latter sometimes bifid. In old specimens, besides the terminal frondlet, the branches give off very numerous lateral ones of a smaller size, which are simply bifid, and of a narrow wedge-shaped outline: the abundance of these sometimes makes the specimen very bushy. *Apices* fastigiate. *Fructi-*

fication: 1, roundish or oval, opake *tubercles* borne on short stalks, which spring irregularly from the sides of the stem, and from the lower parts of the frondlets, containing, beneath a thick coat formed of closely packed filaments, a dense mass of minute spores. 2, dark-red, thickened, wart-like patches of irregular form and size, occupying the disk of the frondlet, and prominent on both surfaces, composed of moniliform filaments. These are usually found on distinct plants, but sometimes occur on those which also bear tubercles. *Tetraspores* unknown (to me). *Colour* of the frond, a deep brownish or livid purple-red; passing to greenish and whitish in decay. *Substance* rigid, somewhat cartilaginous, and thin, very tough.

* * *

This plant bears a considerable resemblance in form to *Rhodymenia Palmetta*, and still more to the *R. flabellifera* of the Southern Ocean, but the colour and the fructification, so far as the latter is known, are very different: and I agree with my valued friend Mrs. Griffiths in regarding this as a species of *Phyllophora*, nearly related to *P. Brodiæi*. In the list given at the end of our first volume a different place has been inadvertently assigned to it.

I am not aware that *tetraspores* have yet been noticed on *P. membranifolia*. The swellings of the periphery which are called *nemathecia*, and which, in their dark colour, and the high organization of their tissue, seem to be connected with fructification, are not uncommonly formed. They usually occur on individuals which do not produce tubercles; but Mrs. Griffiths once found a specimen, a part of which she has kindly communicated to me, which bears both tubercles and nemathecia. This, though a rare occurrence, is not to be wondered at, because these organs have really much resemblance to each other in structure; so much so that it is probable that one is but a metamorphic form of the other, or, at least, is an organ of an analogous nature.

Fig. 1. PHYLLOPHORA MEMBRANIFOLIA. 2. A frondlet, with *nemathecium*:—*both of the natural size*. 3. Vertical section of a *nemathecium*. 4. Part of the same. 5. A tubercle. 6. The same, cut across. 7. Part of a vertical section of the same. 8. Section of the frond:—*all more or less highly magnified.*

Plate CLXIV.

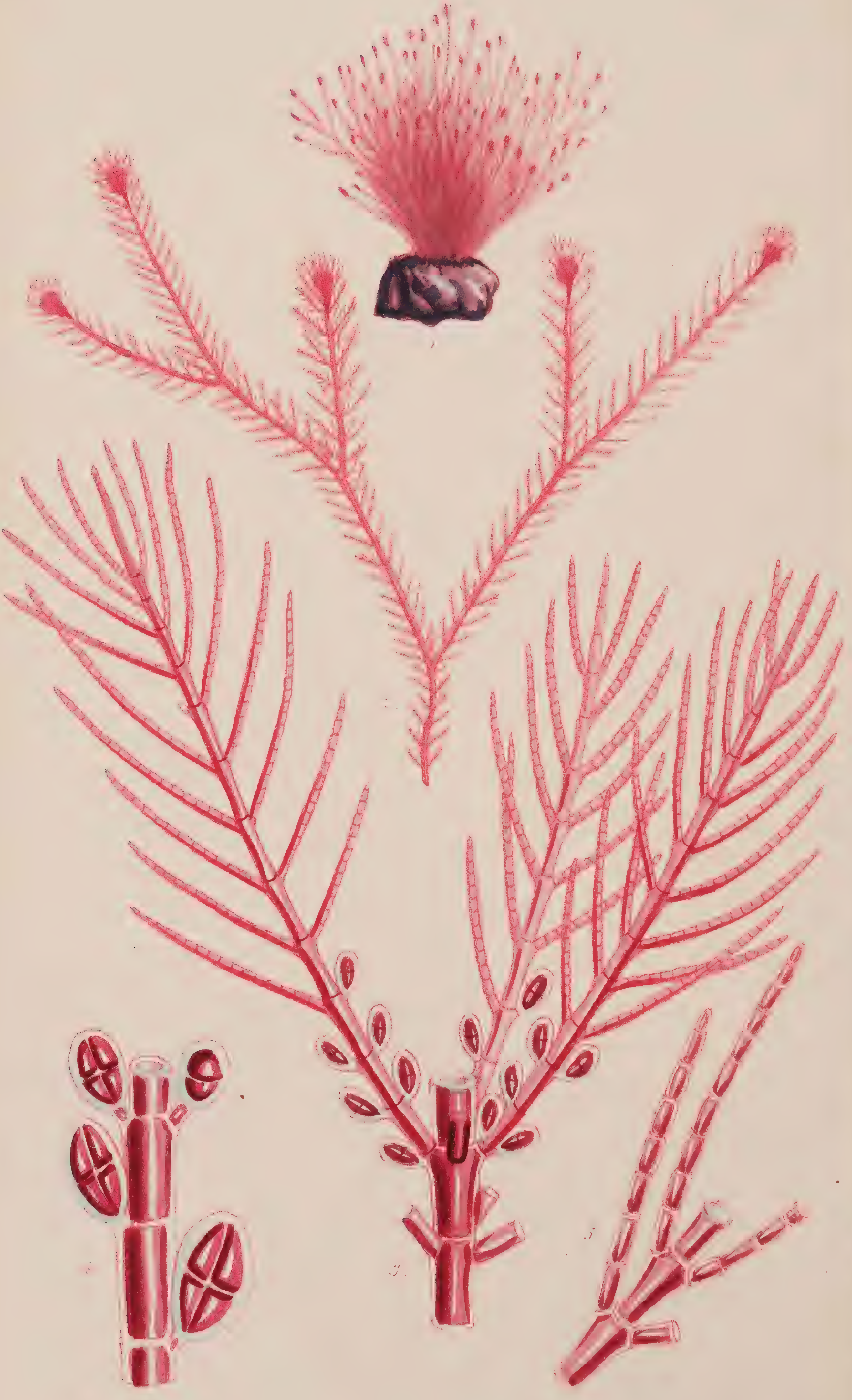

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PLATE CLXIV.

CALLITHAMNION CRUCIATUM, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate, (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores,* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from καλος, *beautiful,* and θαμνιον, a *little shrub.*

CALLITHAMNION *cruciatum*; filaments densely tufted, irregularly and rather sparingly branched; branches alternately divided, jointed, furnished at each joint with two to four opposite or quaternate, slender, short pectinato-pinnate ramuli; tetraspores elliptical, subsessile, borne on the lowermost joints of the ramuli.

CALLITHAMNION cruciatum, *Ag. Syst. Alg.* vol. ii. p. 160. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Wyatt, Alg. Danm.* no. 182. *Harv. Man.* p. 104. *J. Ag. Alg. Medit.* p. 70. *Endl. 3rd Suppl.* p. 34. *Hook. fil. et Harv. in Lond. Journ.* vol. vi. p. 412.

β *pumilum*; much smaller, the ramuli more dense, and the joints shorter.

CALLITHAMNION cruciatum, β pumilum, *Harv. Man.* p. 104.

CALLITHAMNION pumilum, *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Endl. 3rd Suppl.* p. 34. *Harv. in Mack. Fl. Hib.* part 3. p. 213.

HAB. On mud-covered rocks, near low water mark. Annual. Summer. Rather rare. Pier, Torquay, *Mrs. Griffiths.* Salcombe, *Mrs. Wyatt.* Milford Haven, *Mr. Ralfs.* Plymouth, *Rev. W. S. Hore.* Cork Harbour, *Dr. J. R. Harvey.* Coast of Down, *Mr. W. Thompson.* Ferriter's Cove, Kerry, *Mr. W. Andrews.* β, Miltown Malbay, *W.H.H.*

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas. Tasmania, *Mr. Gunn.*

DESCR. *Filaments* one to two inches long, capillary, flaccid, densely tufted, sparingly branched in an irregular manner. *Branches* mostly alternately divided, the lesser divisions furnished with short lateral branchlets, jointed; each joint throughout the whole length of the plant furnished with slender opposite or quaternate and cruciate ramuli. *Ramuli* not more than half the diameter of the branches, from half a line to nearly a line long, erecto-patent, straight, pectinato-pinnate; the pinnulæ opposite, very slender, cylindrical, not greatly tapering to the point. *Apices* of the branches darkened, owing to the crowding of the terminal ramuli. *Articulations* of the stem and branches from two to four times as long as broad; of the ramuli twice or thrice; and of the pinnulæ about twice as long as broad: the dissepiments somewhat contracted. *Tetraspores* formed by the metamorphosis of the lowermost pinnulæ, sessile or subpedicellate, elliptical, cruciately divided, with a rather narrow limbus. *Favellæ* I have not seen. *Colour* a brownish-red. *Substance* flaccid. The plant adheres closely to paper, and is apt to decompose if wetted after once it has been dried.

A very distinct and beautiful species of this charming genus, and one which is very widely distributed. It was first noticed in the Mediterranean, from whence I have received excellent specimens. Mrs. Griffiths added it to the British Flora nearly twenty years ago; and it has since been found on several parts of the English and Irish coasts. More recently Mr. Gunn has sent specimens from Tasmania exactly similar to our European plant, thus proving that it exists in the temperate regions of the Southern, as well as of the Northern Hemisphere. It is not subject to much variation, except of a very minor character. The opposite or quaternate pinnulated ramuli constantly mark it. In some individuals the joints of the stem are much shorter, the ramuli more dense, and the whole plant very small. These, before I was well acquainted with the variations of *C. cruciatum*, I was disposed to regard as a distinct species, which I described under the name of *pumilum*, in the British Flora. A better acquaintance with the species has shown that this view cannot be maintained. I have specimens from Torquay showing every gradation between the original *pumilum* and the normal state of the plant; and I have others which vary in an opposite direction—the joints being very long, and the ramuli distant and either simple or with very few pinnulæ. Such specimens show an approach to the rare *C. floccosum*, though abundantly different from any state of that beautiful plant. An excellent mark for *C. cruciatum*, by which it may be known at a glance, lies in the very dense tufts terminating the branches, consisting of undeveloped ramuli.

Fig. 1. CALLITHAMNION CRUCIATUM; a tuft:—*of the natural size.* 2. Part of a branch, clothed with ramuli. 3. Portion, with fertile ramuli. 4. Tetraspores, *in situ.* 5. Uppermost pinnulæ:—*all more or less highly magnified.*

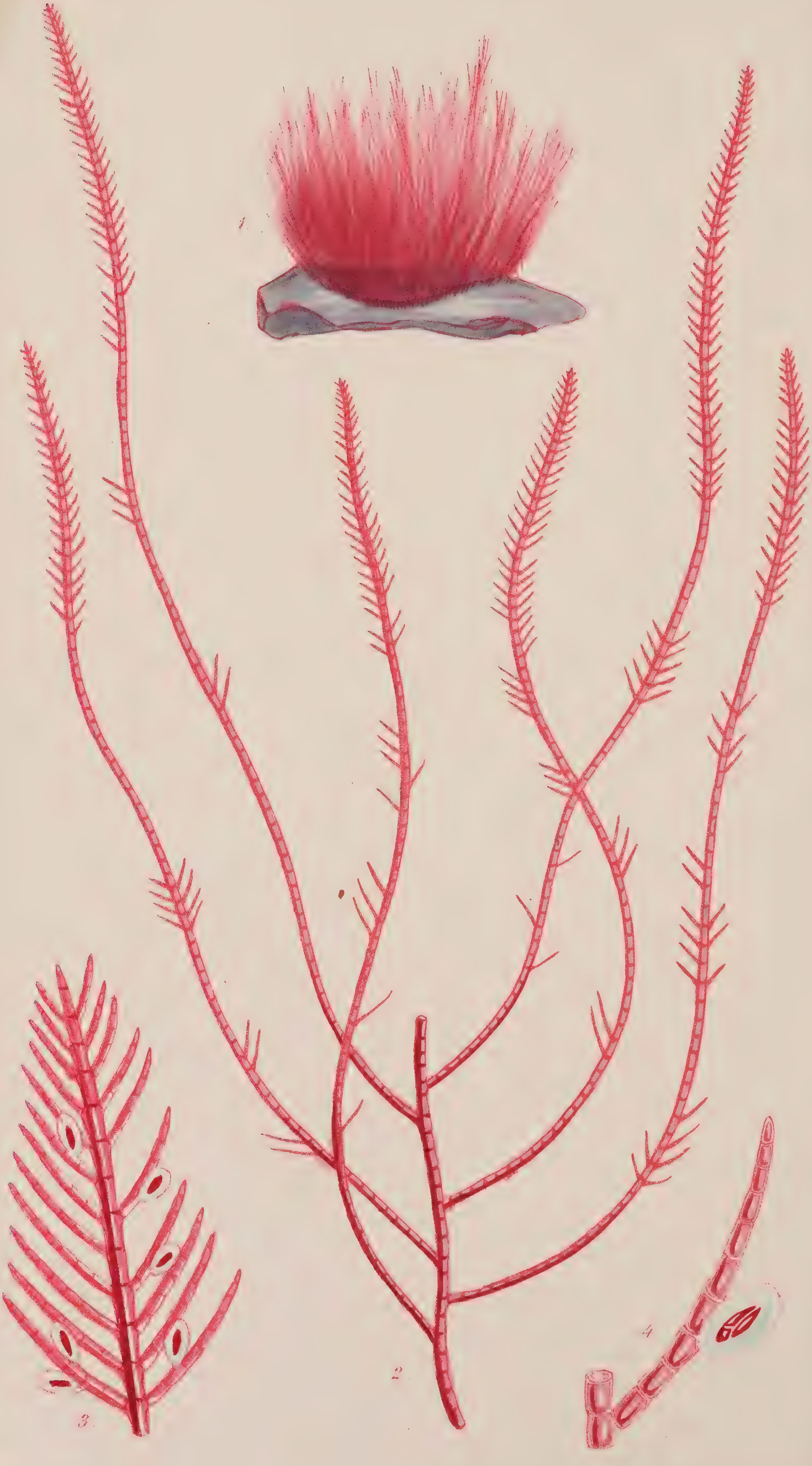

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PLATE CLXV.

CALLITHAMNION BARBATUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), —from καλος, *beautiful*, and θαμνιον, *a little shrub*.

CALLITHAMNION *barbatum*; stems (rising from creeping filaments?) much and irregularly branched; branches mostly alternate, long, subsimple, naked, or pinnulated with minute, opposite, spine-like, erecto-patent ramuli; articulations twice or thrice as long as broad; tetraspores elliptic oblong, with a wide limbus, sessile on the sides of the pinnulæ.

CALLITHAMNION barbatum, *Ag. Syst. Alg.* vol. ii. p. 181. *Harv. Man.* p. 114. *J. Ag. Alg. Medit.* p. 70. *Endl.* 3rd *Suppl.* p. 34. *E. Bot. Suppl.* t. 2889.

CALLITHAMNION Ralfsii, *Harv. in Herb.* (1838.)

HAB. On mud-covered rocks, in the sea, between tide-marks. Very rare. Perennial? Ilfracombe, and on the quay at Penzance, *Mr. Ralfs.* (1838.) Dredged at Weymouth, *Rev. M. J. Berkeley.*

GEOGR. DISTR. Mediterranean Sea.

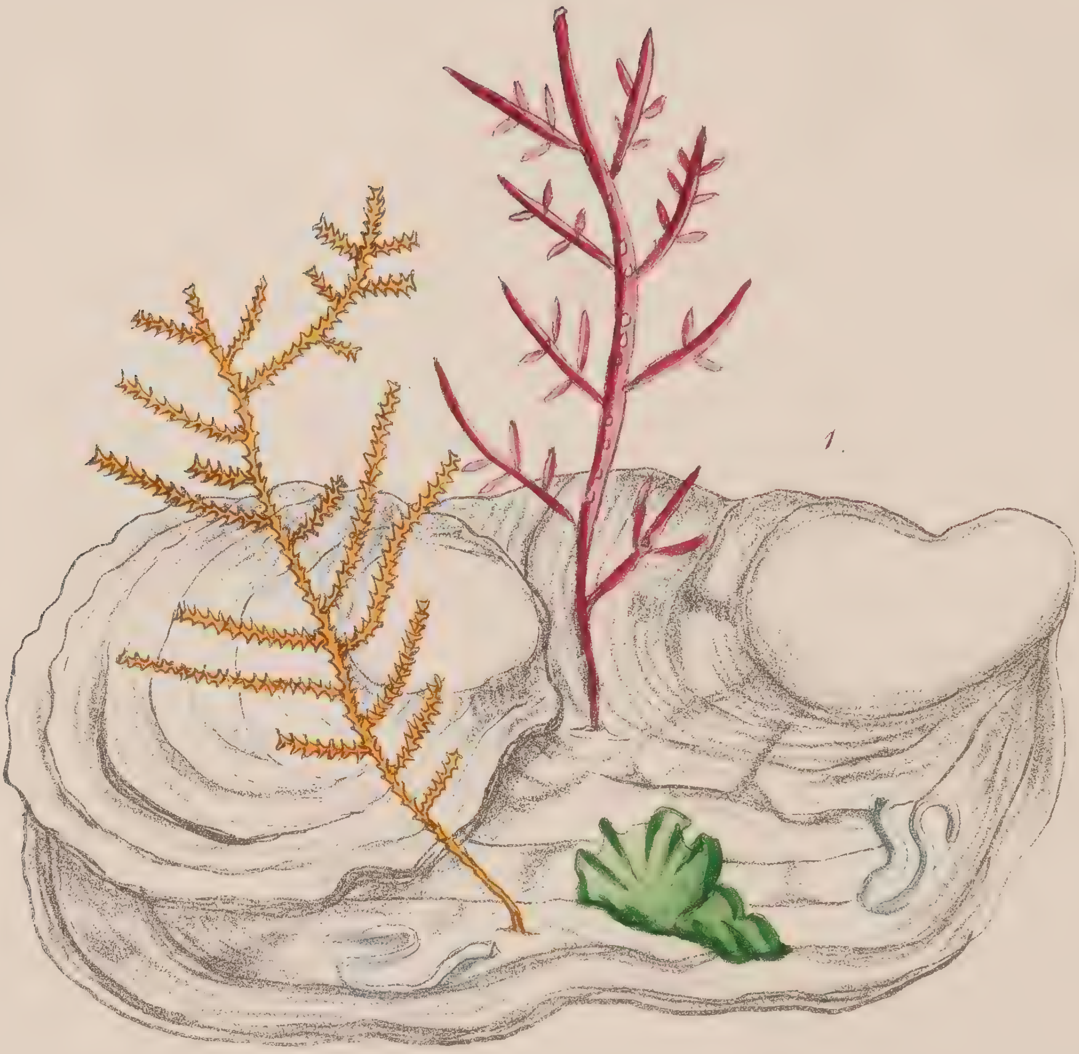
DESCR. *Filaments* forming intricate tufts, densely matted together and apparently connected at base by creeping fibres, but difficult to disentangle; one to two inches high, much and irregularly branched; branches alternate or opposite, erect, long, simple, or bearing others similar to themselves, their upper half closely pinnulated with very short, opposite, spine-like, erecto-patent ramuli, their lower part either naked or irregularly pinnulated with similar ramuli. *Articulations* cylindrical, twice or thrice as long as broad. *Tetraspores* elliptic-oblong, with a very wide limbus, borne on the sides of the ramuli, sessile, mostly solitary. *Favellæ* unknown. *Substance* membranaceous and somewhat rigid, imperfectly adhering to paper. *Colour* a dull brownish-red, without gloss.

* * *

To the naked eye, this species, unless closely examined, resembles a ragged specimen of *C. floridulum*, though when compared under a lens with that plant the two are seen to be abundantly different. The short opposite ramuli which feather the ends of the branches of *C. barbatum*, and which are most abundant in summer specimens, though perhaps always to be found in degree, form the striking mark of the species. Yet these ramuli are not noticed by Agardh in the description which he has given, in his *Species Algarum.* It would, therefore, be very questionable whether our plant and his were identical had not *Mr. J. G. Agardh* seen and examined specimens of the British plant, and pronounced them to be similar to those described by his father. But for this evidence, which I suppose is conclusive, I should have regarded the plant now described as a novelty; and, indeed, until the specimens had been submitted to Mr. Agardh, I did so regard it, and had intended to dedicate it to its estimable discoverer in this country, by the name *C. Ralfsii.* Should future observations prove that the plant of the elder Agardh is really different (as I suspect may be the case) I hope that the name *Ralfsii* may be retained for our British plant. I have seen no specimens but those gathered by Mr. Ralfs in 1838; nor have I heard of the species having been met with by any one else, except Mr. Berkeley, on the British coast.

Fig. 1. CALLITHAMNION barbatum; tuft:—*of the natural size.* 2. Portion of a filament. 3. Apex of a branch, with tetraspores. 4. Ramulus and tetraspores:—*all more or less highly magnified.*

Plate CLXVI.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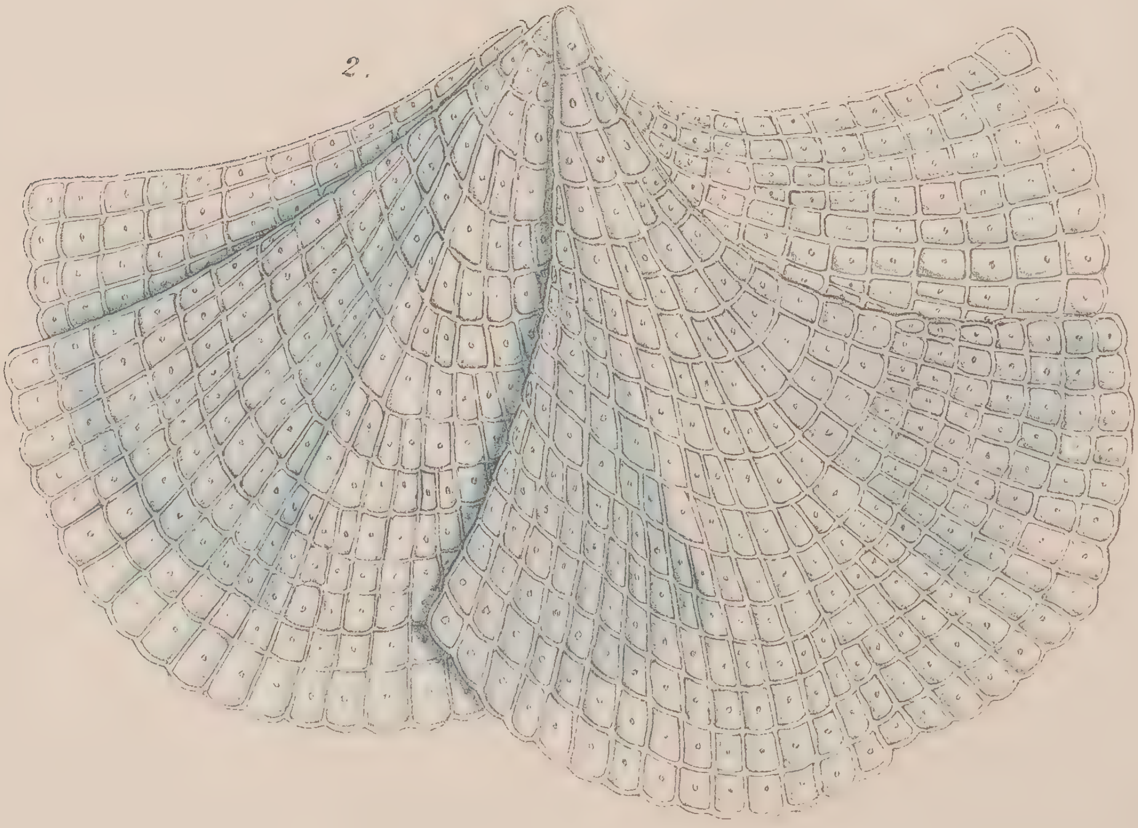
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W. H. H. del. et lith.

Reeve, Benham & Reeve, imp.

PLATE CLXVI.

LITHOCYSTIS ALLMANNI, *Harv.*

GEN. CHAR. "Plant calcareous, consisting of a single plane of cellules, which are disposed in radiating dichotomous series forming an appressed flabelliform frond." *Allm.* LITHOCYSTIS (*Allm.*),—from λιθος, a *stone,* and κυστις, a *bladder*; because the cells are coated with a stony membrane.

LITHOCYSTIS *Allmanni.*

HAB. Parasitical on *Chrysymenia clavellosa,* from an Oyster-bed, Malahide, Dublin Bay, *Professor Allman.*

GEOGR. DISTR. —— ?

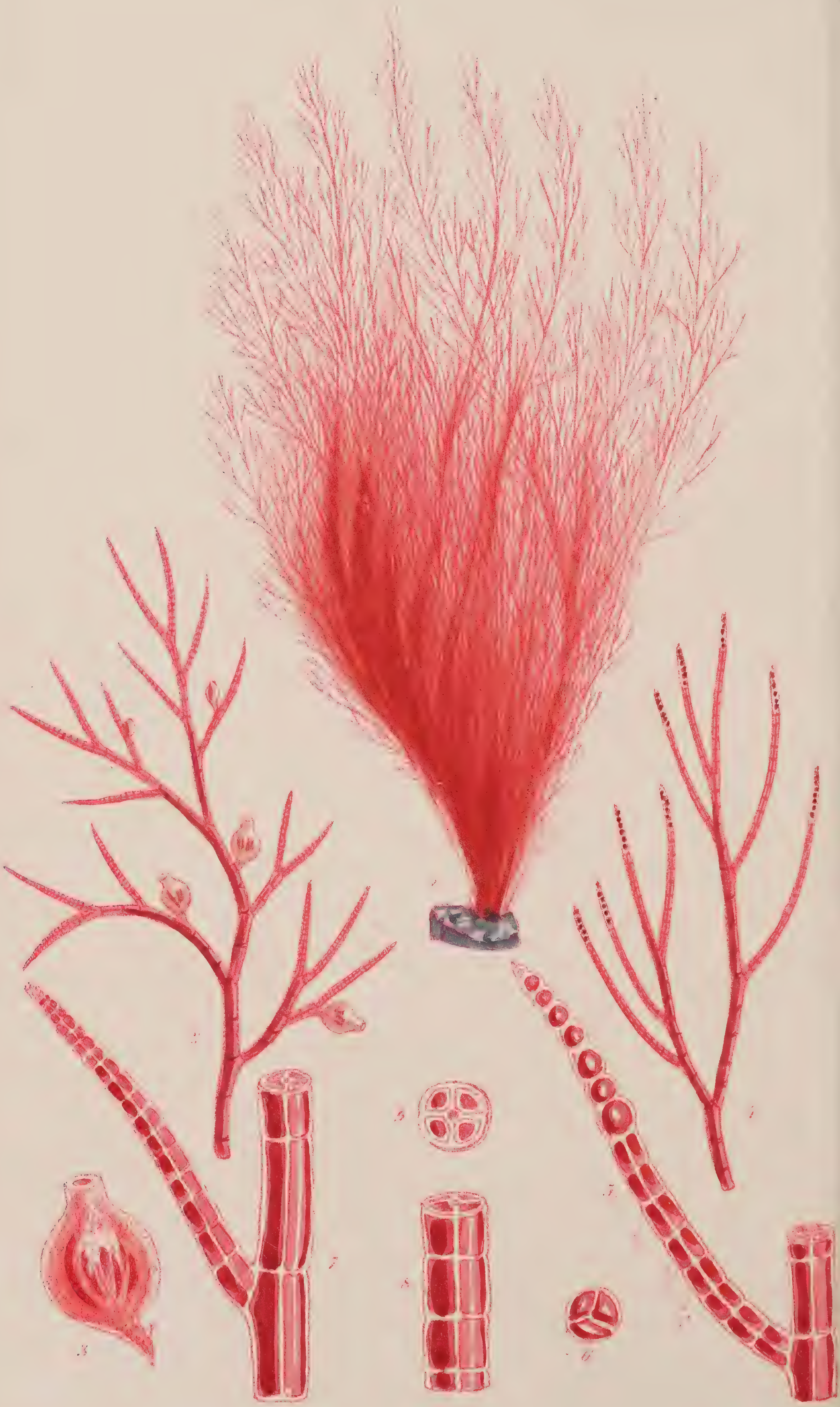
DESCR. "This minute Alga presents itself to the naked eye in the form of very small whitish dots scattered over the surface of the vegetable, which it has selected for its parasitic growth. Under the microscope each dot is seen to consist sometimes of one, but more frequently of a cluster of several transparent and colourless flabelliform fronds, whose component cellules radiate from the apex of the frond, and after repeated dichotomous division, terminate by forming a convex margin. In almost all the cells there may be seen a very evident sphærical nucleus. The whole plant is brittle, and pulverisable under pressure, its hyaline frond being mainly composed of carbonate of lime, which does not merely incrust it, but is intimately incorporated with its tissues. In *Lithocystis,* indeed, the carbonate of lime would seem in every way to represent and replace the silica of the *Diatomaceæ.* Under the action of dilute acid the mineral matter is entirely dissolved, and nothing remains but an exceedingly delicate organic film, in which the original form of the plant can with difficulty be detected. Nothing distinctly referable to fructification has been seen in any of the specimens examined. *Lithocystis* manifestly approximates very closely to *Coleochæte,* a genus established by Brebisson for a fresh-water Alga, and one with which the *Phylactidium* of Kützing is evidently identical. Setting aside the sheathed bristles of *Coleochæte*—a character by no means constant—*Lithocystis* would appear to differ from the latter chiefly by its calcareous composition, a feature, however, of much importance, and plainly bringing the present plant into direct relation with the Corallines." *Allm.*

In one of the best books of the last generation written for the amusement and instruction of young persons,—I mean *Evenings at Home,*—there is an excellent paper, headed "Eyes and no Eyes, or the Art of Seeing." The history of the discovery of the curious and beautiful little plant here figured reminds me of that paper, offering, as it does, a striking illustration of the advantage to a naturalist of having his eye constantly on the watch. My friend Professor Allman, who omits no opportunity of adding an unobserved fact or a new member to biological science, noticed that an oyster-shell (found on a supper-table) was infested by some animal and vegetable parasites; among others, by some poor looking specimens of *Chrysymenia clavellosa.* On looking a little closer at these latter, he spied, what few but an observer so lynx-eyed would have discovered, some minute white dots, irregularly placed on the surface of the fronds. These he deemed worthy of examination, and laid aside the oyster-shell for that purpose. On submitting a fragment of the dotted *Chrysymenia* to the microscope the following day, the first trial rewarded him with a sight of the delicate, glassy fan which is here copied from his drawing. I have added a representation of the oyster-shell, as a memento of the discovery; recommending to all botanical oyster-eaters to make a similar use of their eyes.

The aspect of this little parasite is strikingly similar to that of a *Coleochæte,* but the calcareous nature of the cellular membrane seems to point to a different affinity. In the absence of information respecting its fructification, I can form but a guess as to the family in which it may most properly be arranged. In suggesting the *Corallineæ* I am chiefly guided by the calcareous tissue: the *habit,* indeed, is not unlike that of some of the minute *Melobesiæ.* The *structure* is much more simple, and, taking into account the stony nature of the cells, sufficiently peculiar to justify the formation of a new genus for the reception of this organism. For the genus Dr. Allman has suggested the appropriate name *Lithocystis,* and it affords me great pleasure to add the specific name *Allmanni.*

Fig. 1. An old oyster-shell, with various animal and vegetable parasites: *Lithocystis Allmanni,* forming white specks on the frond of *Chrysymenia clavellosa.*
2. Lithocystis Allmanni:—*highly magnified.*

Plate CLXVI



W. H. H. del. et lith

Reeve, Benham & Reeve, imp

PLATE CLXVII.

POLYSIPHONIA URCEOLATA, *Grev.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*),—πολυς, *many*, and σιφων, a *tube*.

POLYSIPHONIA *urceolata*; filaments rigid, setaceous, full-red, much branched, loosely bundled; branches dichotomous, more or less furnished with short, alternate, patent or recurved ramuli; articulations marked with two broad tubes, those of the main branches 3–5 times longer than broad; siphons four, surrounding a minute cavity; capsules pitcher-shaped, with a produced mouth, generally stalked; tetraspores in the upper part of the ramuli.

POLYSIPHONIA urceolata, *Grev. Fl. Edin.* p. 309. *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Wyatt, Alg. Danm.* no. 133. *Harv. in Mack. Fl. Hib.* part 3. p. 207. *Harv. Man.* p. 95. *Endl. 3rd Suppl.* p. 45.

POLYSIPHONIA patens, *Harv. in Hook. Br. Fl.* vol. ii. p. 330. *Endl. 3rd Suppl.* p. 54.

HUTCHINSIA urceolata, *Hook. Fl. Scot.* vol. ii. p. 88. *Lyngb. Hyd. Dan.* p. 110. t. 34. *Ag. Syst.* p. 151. *Ag. Sp. Alg.* vol. ii. p. 70.

HUTCHINSIA patens, *Ag. Sp. Alg.* p. 71.

CONFERVA urceolata, *Dillw.* no. 156. t. G. *E. Bot.* t. 2365.

CONFERVA patens, *Dillw.* no. 157. t. G.

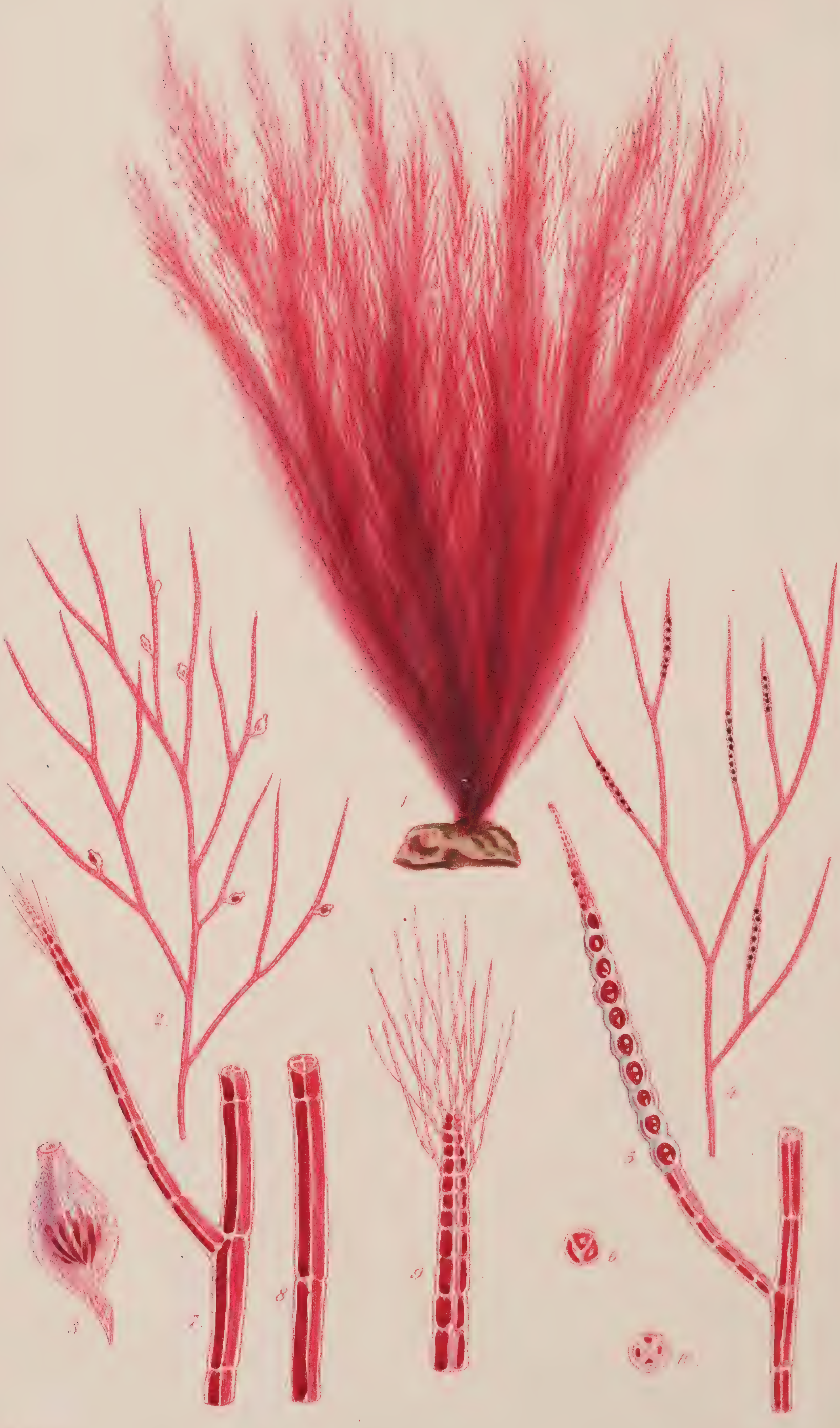
HAB. On rocks near low-water mark, and on the stems of *Laminaria digitata.* Annual Summer. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Northern Europe. Iceland. North America.

DESCR. *Fronds* densely tufted, often entangled at base, and connected by root-like fibres, from three to nine inches long, as thick as horsehair at base, gradually attenuated upwards, much and irregularly branched, often very bushy. Main branches somewhat dichotomous, more or less furnished with short, lateral, simple, or sparingly divided patent ramuli, which bear a few thorn-like, lesser divisions. Sometimes these thorn-like ramelli are very abundant, and hooked backwards, when the plant becomes *P. patens* of authors; at other times they are few and more erect. *Articulations* very different in different parts of the frond: those of the lower part of the stem about as long as broad; of the branches generally thrice, but sometimes five times as long; and of the ramuli, rather shorter than their breadth; all marked by two wide tubes, and exhibiting, when cut transversely, four siphons surrounding a minute cavity. *Capsules* on short stalks, elegantly urn-shaped. *Tetraspores* forming a row in the upper half of the ultimate ramuli, and generally extending to the apex. *Colour* a full, deep red, becoming much darker, and even black in drying. *Substance* rigid, not strongly adhering to paper.

Polysiphonia urceolata is subject to some minor variations, according to the locality in which it grows. When found on rocks, in exposed situations, near low-water mark, the filaments are more robust, of greater length, and much more branching; these constitute the typical form of the species, as restricted by Agardh. When growing on the stems of *Laminaria digitata* the filaments are much less branched, the lateral branches shorter, and the ramuli remarkably squarrose, often hooked backwards. Such specimens constitute the *P. patens* of Agardh, and are well represented in Lyngbye's figure quoted above. To the naked eye the extreme states of these two varieties are sufficiently characterised, but various intermediate forms insensibly connect them, and I have found it impossible to discover any satisfactory distinction between them. The *Conferva patens* of Dillwyn appears to be merely the young state of the plant.

Fig. 1. POLYSIPHONIA URCEOLATA; tuft:—*of the natural size.* 2. Branch with capsules. 3. A capsule. 4. Branch with tetraspores. 5. Ramulus from the same. 6. A tetraspore. 7. Portion of a branch and ramulus, to show the comparative length of the joints. 8. Portion of the lower part of the stem, to show the same. 9. Cross-section of a filament:—*all more or less highly magnified.*



Reeve, Benham & Reeve, imp.

PLATE CLXVIII.

POLYSIPHONIA FORMOSA, *Suhr.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. POLYSIPHONIA (*Grev.*), — from πολυς, *many*, and σιφων, a *tube.*

POLYSIPHONIA *formosa*; filaments exceedingly slender and flaccid, full-red, much divided; branches subdichotomous, long, flexuous, more or less furnished with scattered, spreading, alternate, subulate ramuli; articulations marked with two broad tubes, those of the main branches many times (5–10 times) longer than broad, of the ramuli short; siphons four, surrounding a minute cavity; capsules urceolate, generally stalked; tetraspores imbedded in the middle part of the ramuli.

POLYSIPHONIA formosa, *Suhr. Bot. Zeit.* 1831, p. 709. *Harv. Man.* p. 94. *Wyatt, Alg. Danm.* no. 216.

POLYSIPHONIA gracilis, *Grev. MSS.*

HAB. On rocks, near low-water mark. Annual. Summer. Not uncommon. Lerwick, Shetland, *Suhr.* Bute, *Dr. Greville.* Belfast Bay, *Mr. Thompson.* Antrim, *Mr. D. Moore.* Clontarf, *Miss Ball.* Galway, *Mr. M'Calla.* Malahide, *W.H.H.* River Dart, *Mrs. Griffiths.* Salcombe, *Mrs. Wyatt.* Plymouth, *Rev. W. S. Hore, and Dr. Cocks.* Whitsand Bay, *Dr. Jacob.* Sidmouth, *Rev. R. Cresswell.*

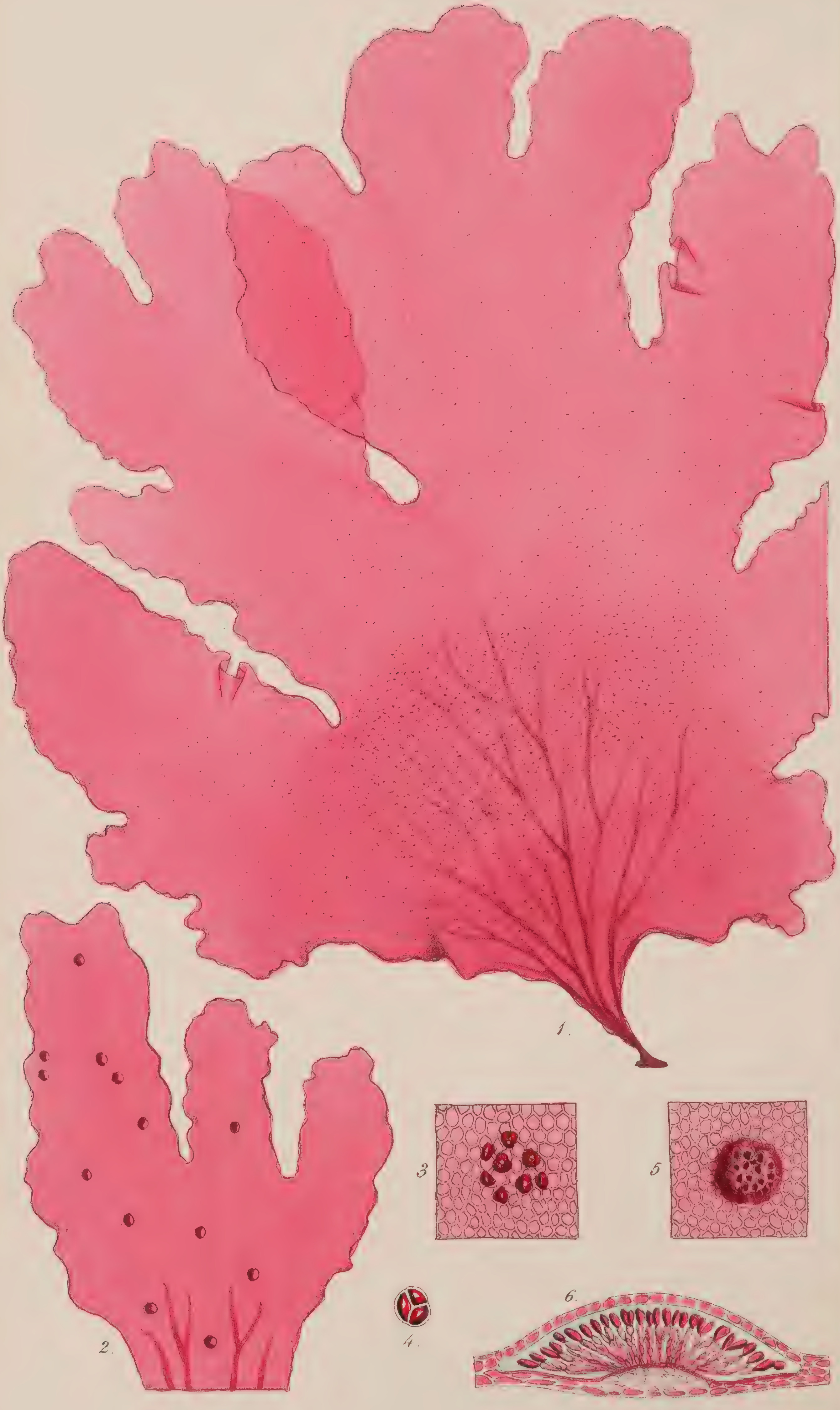
GEOGR. DISTR. Atlantic shores of Northern Europe. Baltic Sea.

DESCR. *Filaments* densely tufted, from six to ten inches in length, the larger specimens as slender as a human hair, the smaller and more delicate much more slender, excessively branched, in a manner between alternate and dichotomous; branches three or four inches long, flexuous, several times divided, the penultimate divisions more or less furnished with alternate, patent, subsimple ramuli, ultimate ramuli subulate, spreading. *Apices* blunt, and often clothed with byssoid fibres. *Articulations* very variable in different parts of the frond; those of the stem about twice as long as broad; of the main branches from eight to ten times; of the smaller branches from four to five times; and of the ramuli about once and half as long as broad. *Interstices* pellucid. *Capsules* urceolate, scattered on the sides of the upper ramuli. *Tetraspores* forming a line in the middle of the ramuli, which then become fusiform. *Colour* a full, deep, and somewhat pinky-red, becoming red-brown, or very dark, in drying. *Substance* flaccid, membranous, or, when young, somewhat gelatinous, closely adhering to paper, and somewhat glossy when dry.

This species is, as may be seen from the magnified figures in our plate, very closely related to the subject of the previous plate, and it is for this reason that I have figured them consecutively. *P. formosa* differs from *P. urceolata* chiefly in the much greater tenuity of its filaments, and the greater proportional length of its joints; it agrees with that species in its colour, its ramification and the peculiar form of its capsules. Were we merely to take into consideration the beautifully feathered and luxuriant specimens collected by Dr. Greville on the shores of Bute, and compare them with the coarse growing state of *P. urceolata* commonly met with, we should probably pronounce the two species to be broadly distinguished, and should anticipate no difficulty in determining between them. But it must be admitted that specimens do occur which show a much greater approach both in habit and character; and while I am unwilling to erase *P. formosa* from the list altogether, I am obliged to allow that I have seen individual specimens which it has puzzled me to say whether they ought to be referred to *urceolata* or *formosa.* When such perplexities meet us on the shore, one is apt to conclude that specific division has been carried too far. In the majority of cases, however, the limits are sufficiently marked. *P. formosa* appears to be a plant of bays and estuaries; *P. urceolata,* of the more exposed parts of the coast; and, whether we look on them as different species or as well-marked varieties of one species, they appear to be worthy of separate notice.

Fig. 1. POLYSIPHONIA FORMOSA; tuft:—*of the natural size.* 2. A branch with capsules. 3. A capsule. 4. A branch with tetraspores. 5. Ramulus of the same. 6. A tetraspore. 7. Portion of a branch, with ramulus. 8. Portion of a main branch. 9. Apex of a young ramulus, with byssoid fibres. 10. Cross section of the filament:—*all more or less highly magnified.*

Plate CLXIX.



W. H. H. del et lith.

Reeve Benham & Reeve imp.

PLATE CLXIX.

NITOPHYLLUM HILLIÆ, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red, (rarely purplish) irregularly cleft, veinless, or furnished with irregular veins towards the base. *Fructification* two-fold, on distinct plants; 1, convex *tubercles* (*coccidia*) immersed in the frond, and containing a mass of spores; 2, *tetraspores* grouped into definite *sori*, or spots, variously scattered over the frond. NITOPHYLLUM (*Grev.*),—corruptly formed from *nitor*, to *shine*, and *φυλλον*, a *leaf*.

NITOPHYLLUM *Hilliæ*; frond thickish, but tender, veiny towards the base, of a roundish outline, very irregularly and more or less deeply cleft; the segments oblong, slightly waved, obtuse; spots of granules dot-like, very minute, densely scattered over the surface of the frond.

NITOPHYLLUM Hilliæ, *Grev. Alg. Brit.* p. 80.

NITOPHYLLUM ulvoideum, *Hook. Br. Fl.* vol. ii. p. 287. *Wyatt, Alg. Danm.* no. 16. *Harv. Man.* p. 57.

AGLAIOPHYLLUM Hilliæ, *Endl. 3rd Suppl.* p. 52.

DELESSERIA Hilliæ, *Grev. Crypt. Fl.* t. 351.

HAB. On the shady sides of deep, tidal pools, near low-water mark. Rare. Annual. Summer and autumn. Plymouth, *Miss Hill;* also *Messrs. Rohloff, Hore, and Cocks.* Torquay, *Mrs. Griffiths.* Whitsand Bay, *Dr. Jacobs.* Scilly Islands, *Miss White.* Mountsbay, *Mr. Ralfs.* Jersey, *Miss Turner.* Valentia, Ireland, *W. H. H.*

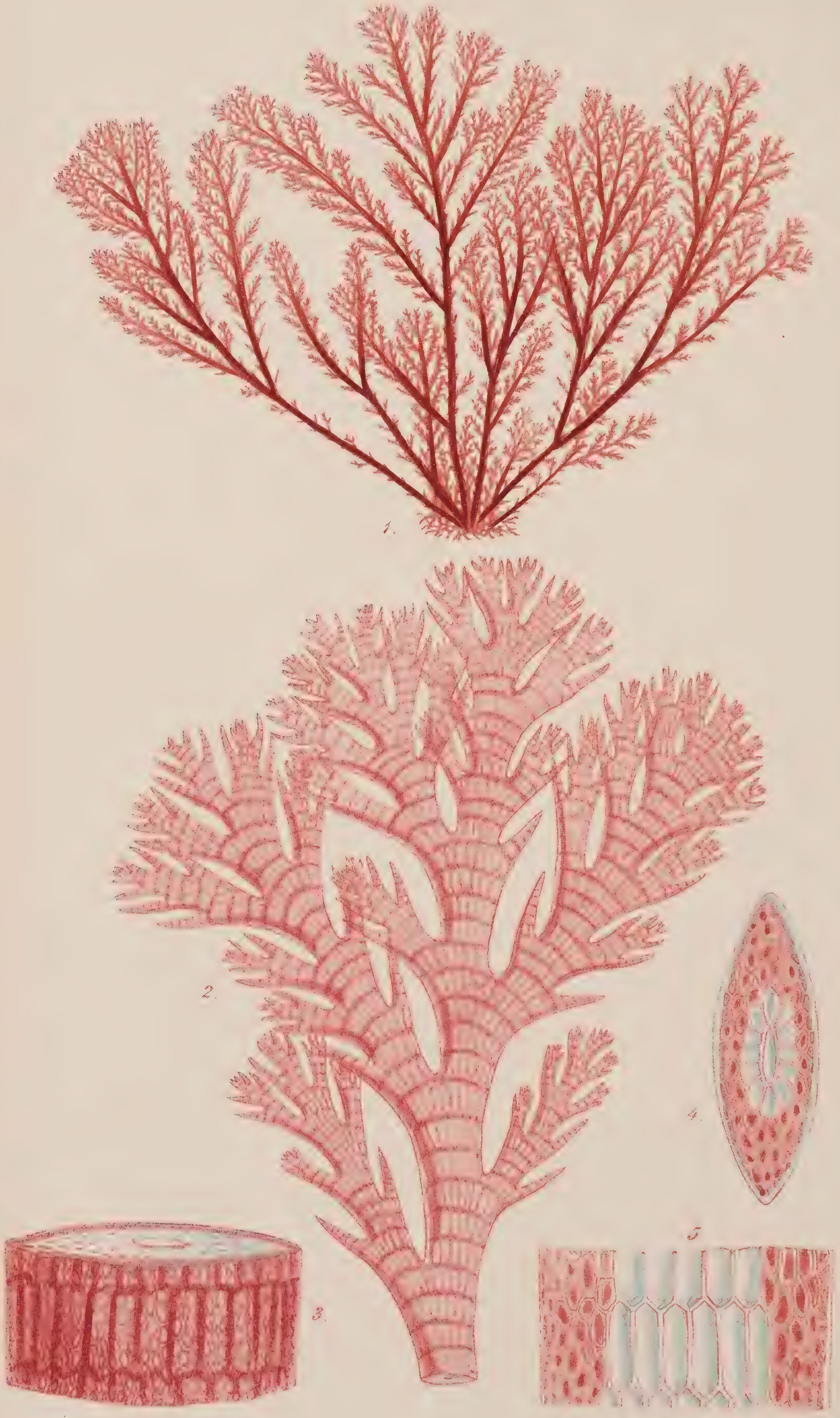
GEOGR. DISTR. Coast of France, rare.

DESCR. *Root* a small, conical callus. *Stem* from a line to nearly half an inch in length, cylindrical at base, compressed upwards, and rapidly expanding into a roundish or somewhat flabellate frond, from four to twelve or sixteen inches in length. Frond very irregularly divided; sometimes nearly simple, with a few shallow marginal lobes, or broad crenatures; sometimes deeply cleft, nearly to the base, into a few broad segments, lobed at the margin; and sometimes deeply cut into ribbon-like laciniæ, proliferous from the margin, and considerably waved and crisped. Through the lower part of the frond run numerous, branching, flexuous veins, which are more or less apparent in different specimens, sometimes being very faint, sometimes strongly marked; and rarely, if ever, wholly absent. *Tubercles* as large as turnip-seed, scattered, hemispherical, containing a tuft of moniliform filaments, fixed to a central placenta, and forming *spores* from their terminal articulations. *Tetraspores* grouped in minute, roundish or oblong, dot-like sori profusely scattered over the greater part of the frond. *Substance* rather thick, tender, semi-transparent, adhering to paper in drying, in which state the surface retains some gloss. *Colour*, when growing, a fine, deep-crimson; becoming rosy in old age; changing to orange in fresh water, and, when dry, acquiring a brownish tint.

I have thought it right to restore the specific name under which this fine species has been described by Dr. Greville, in preference to that of *ulvoideum*, which I adopted in the Manual, in deference to the authority of Sir W. Hooker, who, in the British Flora, regards *Nitophyllum Hilliæ* as identical with *Fucus ulvoides* of Turner. By a reference to the Historia Fucorum it will be seen that *Fucus ulvoides* was founded on specimens communicated by Miss Hutchins, whose locality is alone mentioned for the species; although in the remarks appended to the description, Mr. Turner speaks of other specimens, received from Miss Hill, which he was disposed to consider the same, and which were, no doubt, our *Hilliæ*. These are the specimens which Sir W. Hooker mentions in the British Flora, as existing in his Herbarium. But these specimens, on which Mr. Turner's mind was not fully decided, (otherwise he would have quoted Miss Hill's habitat in its proper place,) cannot be regarded as the *ulvoides* of that author, unless they can be shown to be identical with those collected by Miss Hutchin's, from which the figure and description were taken. In the absence of direct evidence, which an inspection of Mr. Turner's Herbarium could alone supply, I am forced to judge of Miss Hutchins's *ulvoides* by the figure and description; and these, I have no hesitation in saying, agree in all respects with *tubercle-fruited* individuals of *N. punctatum*, and are not characteristic of our *N. Hilliæ*. I think it is, therefore, clear that the *Fucus ulvoides* of Turner must be considered a synonym of *N. punctatum*; and if this be admitted, all will agree, and none more readily than Sir W. Hooker, that in dedicating the present species to the memory of Miss Hill, its discoverer, and one of the most acute and successful marine botanists of her day, Dr. Greville has but paid a well-earned tribute to departed worth.

Fig. 1. A frond of NITOPHYLLUM HILLIÆ, producing *tetraspores*. 2. Portion of a frond with *tubercles*:—*both of the natural size*. 3. Portion of the surface, with a *sorus*. 4. Tetraspores. 5. Portion of the surface with a tubercle. 6. Vertical section of the same:—*all more or less highly magnified.*

Plate CLXV.



W. H. H. del et lith.

Reeve Benham & Reeve, imp

PLATE CLXX.

RYTIPHLÆA COMPLANATA, *Ag.*

GEN. CHAR. *Frond* filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*), surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute, lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*),—from ρυτις, a *wrinkle*, and φλοιος, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *complanata*; frond brown-red, compressed, pinnate, or bi-tri-pinnate, the lower pinnæ short or abortive, the upper long, straight, erect, virgate, once or twice compounded; pinnulæ subulate, or bifid, erect, closely-set; the axils acute.

RYTIPHLÆA complanata, *Ag. Sp. Alg.* vol. ii. p. 54. *J. Ag. in Linn.* vol. xv. p. 26. *J. Ag. Alg. Medit.* p. 146. *Endl. 3rd Suppl.* p. 48. *Harv. Ner. Austr.* p. 32.

POLYSIPHONIA cristata, *Harv. in Mack. Fl. Hib.* part 3. p. 205. *Harv. Man.* p. 85.

FUCUS cristatus, var. γ. articulatus, *Turn. Hist.* t. 23. *f. h.*

PLOCAMIUM cristatum, *Lamour. Ess.* p. 50. t. 5. f. 1, 2, 3.

HAB. On the rocky beds of shallow tide-pools, exposed, at low-water, to full sunshine, among *Corallina officinalis,* &c. Perennial? Summer. Very rare. Bantry Bay, *Miss Hutchins.* Caarush Point, Miltown Malbay, abundant in one or two tide-pools, but very local, *W. H. H.* (1847). Whitsand Bay, *Dr. Jacob.* Dredged in Plymouth Sound, *Rev. W. S. Hore.*

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea. South of England and Ireland. Cape of Good Hope.

DESCR. *Root*, a mass of branched, creeping, and clasping fibres. *Fronds* densely tufted, from two to four inches high, about half a line in breadth, plano-compressed, simple, or once forked below, flabellately branched, or more or less pinnate, or bi-tri-pinnate above. Lower portion of the stem either naked, or set with short subulate or pinnatifid ramuli; upper branches pinnate with branchlets, which increase in length and in *composition* upwards, the lowermost being simple, the upper pinnatifid, and the uppermost more compound still. All the divisions are strictly alternate and distichous, and the whole frond is marked with arching, transverse striæ, or dark lines, placed at distances of about half the diameter asunder: these indicate the joints of the internal axis, seen through the cells of the surface. *Ramuli* subulate, the older ones becoming bifid, and gradually multifid. I have seen no fruit on British specimens. *Substance* cartilaginous, not closely adhering to paper. *Colour* a dull brownish or somewhat purplish-red; becoming much darker in drying. Unless the specimens of this plant be allowed to remain some hours in fresh-water, they will stain the paper on which they may be laid, dull brown, and will themselves turn completely black and rigid, and refuse to adhere to the paper: by steeping, a large quantity of brown, offensive matter is discharged, and specimens so treated preserve a shade of red, and adhere to paper.

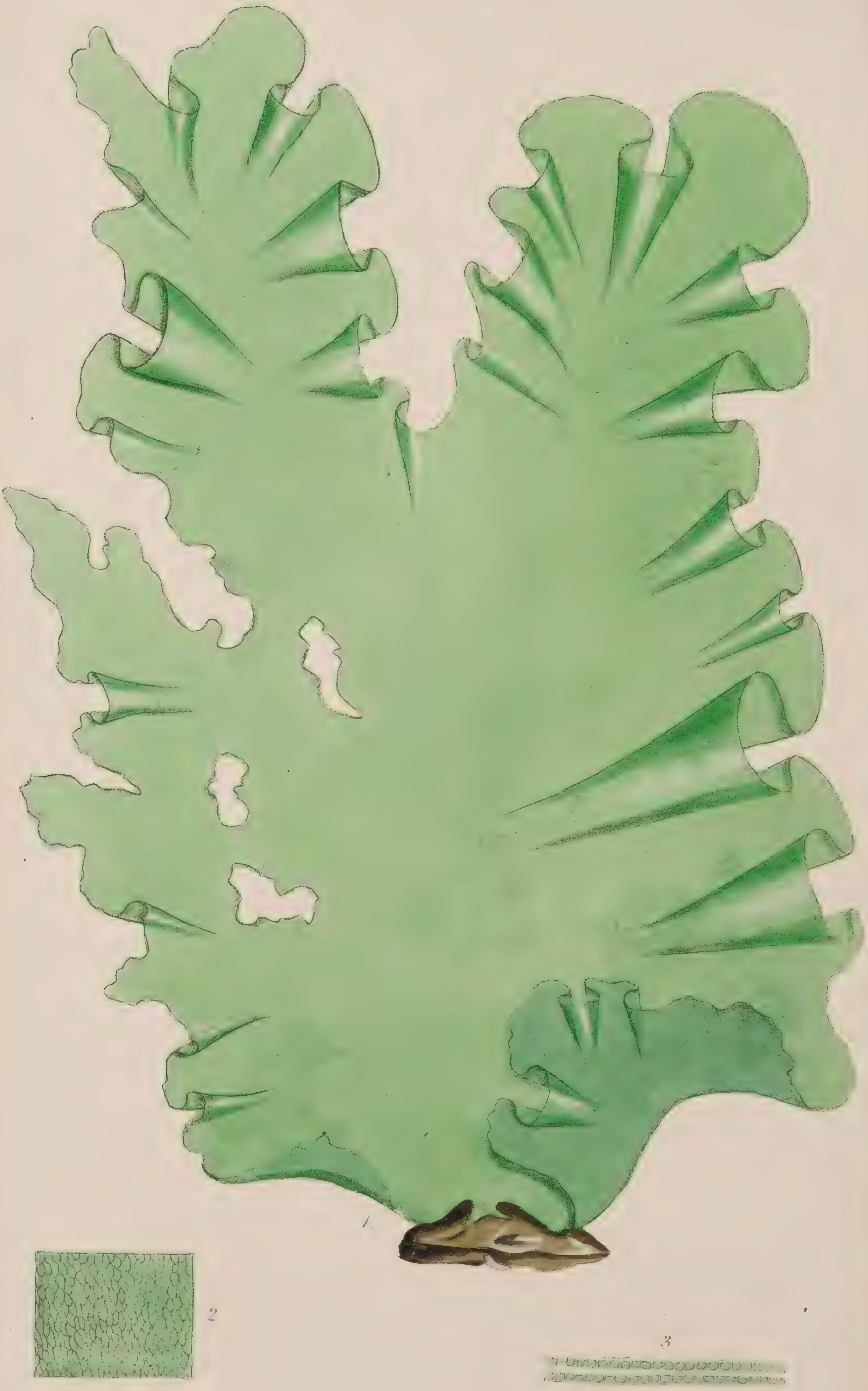
A very rare plant on the British shores, though frequent in the south of Europe. I believe it was first noticed by the late Miss Hutchins of Bantry, who communicated specimens to Mr. Turner, by whom they were regarded as an articulated variety of *Fucus cristatus,* the *Rhodymenia cristata* of modern writers. That so singular a mistake should have been committed by an author of so much judgment and knowledge of his subject as Mr. Turner, only shows the imperfect microscopic examination to which marine plants were at that time subjected. The resemblance between these species is merely an outward one; the structure is very different. In our modern system, therefore, instead of being regarded as varieties of one species, they are placed in widely separated genera.

The present plant has a structure very similar to that of a *Polysiphonia,* in which genus I formerly placed it. Indeed, except that we have here an external coating of cells, there is nothing to distinguish it from an ordinary *Polysiphonia.* It is very closely allied to *Pol. fruticulosa* and *P. thuyoides* of authors, and as these are of exactly similar structure, I propose to transfer them also to the genus *Rytiphlæa,* to which group ought to be added all completely inarticulate species of *Polysiphonia.*

Our figure is made from a specimen gathered at Miltown Malbay, where, in one or two stations, I was so fortunate as to meet with this beautiful plant in considerable abundance, last summer. It completely clothed the rocky bottom of a tide-pool, four or five yards in diameter, and from three to six inches in depth. Where the water became deeper the plant disappeared.

Fig. 1. RYTIPHLÆA COMPLANATA:—*of the natural size.* 2. Portion of a branch. 3. Portion of the surface. 4. Transverse section of the frond. 5. Longitudinal section of the same:—*all more or less magnified.*

Plate CLXXI.



W. H. H. del et lith.
Reeve Benham & Reeve imp.

PLATE CLXXI.

ULVA LATISSIMA, *Linn.*

GEN. CHAR. *Frond* membranaceous, green, expanded, plane, (in some cases saccate when young,) composed of irregular cells. *Fructification*; *granules,* often arranged in fours, scattered over the whole frond. ULVA,—supposed to be from *Ul, water,* in Celtic.

ULVA *latissima*; frond broadly-ovate or oblong, flat, of a full green colour.

ULVA latissima, *Linn. Fl. Suec.* p. 433. *Ag. Sp. Alg.* vol. i. p. 407. *Ag. Syst.* p. 188. *Grev. Alg. Brit.* p. 171. *Hook. Br. Fl.* vol. ii. p. 311. *Wyatt, Alg. Danm.* no. 33. *Harv. in Mack. Fl. Hib.* part 3. p. 242. *Harv. Man.* p. 170. *J. Ag. Alg. Medit.* p. 17. *Kütz. Phyc. Gen.* p. 296. *Mont. Fl. Alg.* p. 149. *Endl. 3rd Suppl.* p. 19.

ULVA lactuca, *Sm. E. Bot.* t. 1551. (*not of Linn.*)

ULVA lactuca, var. latissima, *Lightf. Fl. Scot.* p. 971.

HAB. On rocks and stones in the sea between tide marks; and extending to ten fathoms water, or perhaps a greater depth. Annual. Summer and autumn. Very common on the British shores.

GEOGR. DISTR. Throughout the ocean, nearly to the limits of vegetation in both hemispheres.

DESCR. *Root,* a small disc. *Fronds* from six to twenty inches in length or more, and from three to twelve in breadth, growing in tufts; very variable in shape, oblong, or ovate, with the margin more or less sinuated and wavy, variously plaited, glossy, translucent, of a very soft, but rather firmly membranous, though exceedingly thin, substance, and vivid green colour. In old age the fronds are frequently found pierced by holes, and infested with *Myrionemata,* and are then usually of a pale green colour. Sometimes, especially in specimens dredged from deep water, the colour is of a very dark, and even bluish green, reflecting glaucous tints when under water. In drying, this plant loses much of its brilliancy, and scarcely adheres to paper. *Structure* composed of two strata of exceedingly small, fully coloured cells of irregular shape, separated by an imperfectly coloured, thin, cellular layer.

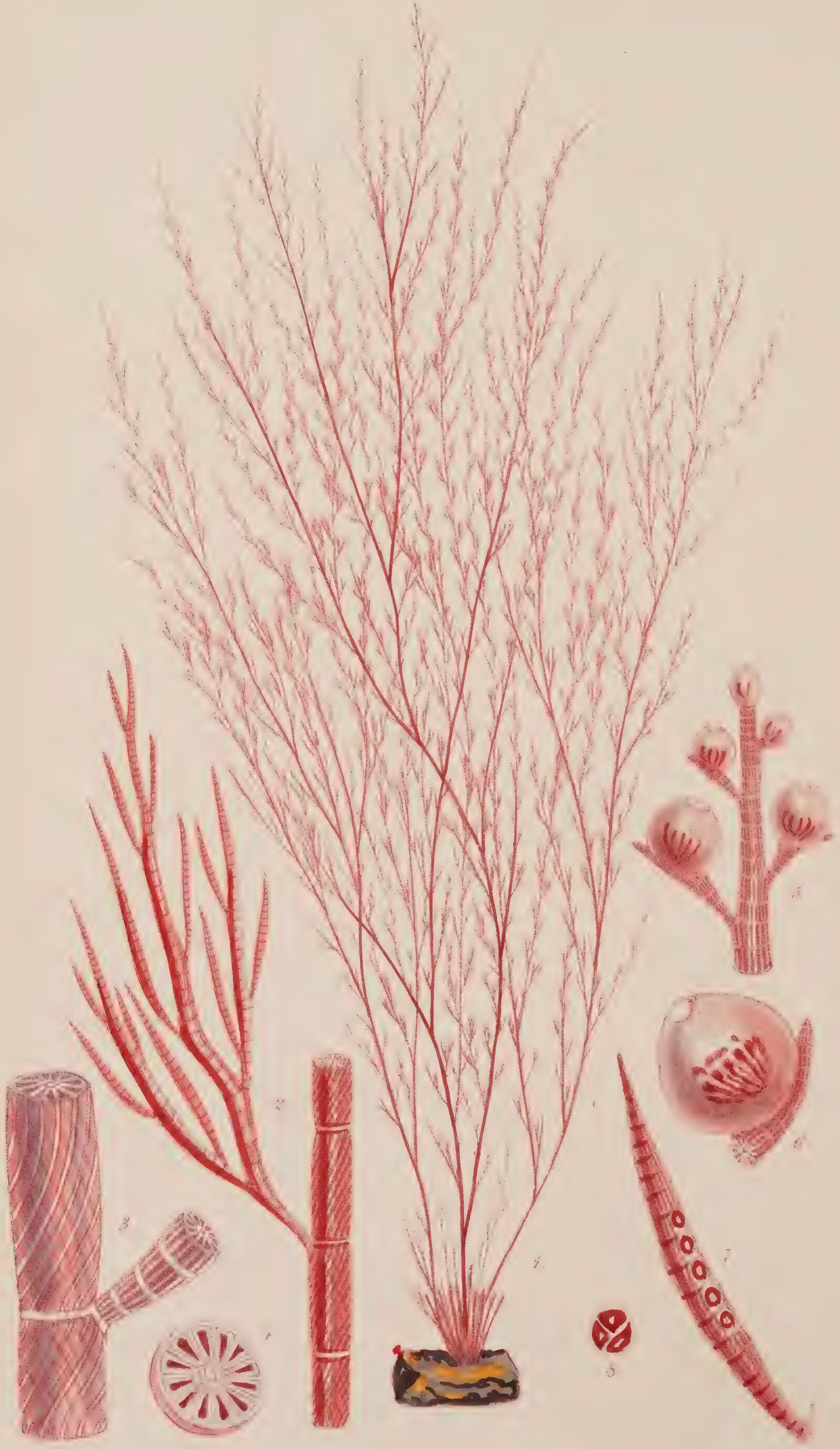
An exceedingly common species, found on all shores, and nearly in all latitudes. Except on the extreme antarctic coasts, where all vegetation, save the *Diatomaceæ,* is at an end, *Ulva latissima* may be said to inhabit every shore. It is as abundant in the tropics as in the temperate zone. Nor do specimens from different countries exhibit many minor points of difference. Some are of more rigid texture than others, but there is little else peculiar about them. The form is too variable among specimens from the same locality to found any characters upon its gradations.

By older writers *Ulva latissima* was either entirely confounded with *U. lactuca,* or else was regarded as merely a variety of it. The distinctions are well pointed out by Dr. Greville, and are as visible in the young as in the full grown plant. *Ulva latissima* is, at all stages, a flat membrane, and in drying scarcely adheres to paper. *U. lactuca* is, at first, a closed sac, which soon bursts; it then exhibits a torn membranous frond, of a much more delicate substance than *U. latissima,* and of a paler colour; and in drying, it closely adheres to paper.

Lightfoot and succeeding authors tell us that *U. latissima,* under the name of *Oyster-green,* or *Green-Sloke,* is brought to table both in England and Scotland, used in the same manner as *Porphyra laciniata,* the true *Laver* or *Sloke.* I have never seen it so used. Lightfoot further says that "the Icelanders ascribe to it an anodyne virtue, and bind the leaves about the front and temples to assuage the head-ache in fevers, and to procure sleep; but the use of it in these intentions is supported by no good authority."—*Fl. Scot.* p. 971–2. If it have any effect in such cases, it probably arises from the cooling influence of the moisture retained in the leaves.

Fig. 1. ULVA LATISSIMA; a frond:—*of the natural size.* 2. Portion of the surface. 3. Section of the frond:—*highly magnified.*

Plate CLXVII.



W. H. H. del et lith.

Reeve, Benham & Reeve imp.

Plate CLXXII.

POLYSIPHONIA ATRO-RUBESCENS, *Grev.*

Gen. Char. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed of numerous radiating cells or tubes, disposed round a central cavity. *Fructification* two-fold, on different individuals; 1, ovate *capsules* (*ceramidia*), furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, *tetraspores*, imbedded in swollen branchlets. Polysiphonia (*Grev.*),—πολυς, *many*, and σιφων, a *tube*.

Polysiphonia *atro-rubescens*; filaments setaceous, sparingly or much branched, dark brownish-red, somewhat rigid; branches long, alternate, very erect, mostly undivided, usually furnished with a second (or third) set of lesser branches, naked, or clothed with short, simple or multifid, scattered, subulate ramuli, which taper to the base and apex; articulations variable, the lower twice or thrice as long as broad, the upper gradually shorter, marked with several, spirally curved tubes; siphons about twelve; capsules broadly ovate or subrotund, sessile, nearly or quite terminal; tetraspores imbedded in multifid ramuli.

Polysiphonia atro-rubescens, *Grev. Fl. Edin.* p. 308. *Hook. Br. Fl.* vol. ii. p. 331. *Harv. in Mack. Fl. Hib.* part 3. *Harv. Man.* p. 87. *Harv. Ner. Aust.* p. 53. *Kütz. Phyc. Gen.* p. 424. *Endl. 3rd Suppl.* p. 45.

Polysiphonia Agardhiana, *Grev. Scot. Crypt. Fl.* t. 210. *Harv. in Hook. Br. Fl.* vol. ii. p. 331. *Wyatt, Alg. Danm.* no. 134. *Kütz. Phyc. Gen.* p. 420. *Endl.* p. 45.

Polysiphonia badia, *Grev. Hook. Br. Fl.* vol. ii. p. 331.

Polysiphonia denudata, *Grev. Hook. Br. Fl.* vol. ii. p. 382. *Endl. 3rd Suppl.* p. 45.

Hutchinsia atro-rubescens, *Lyngb. Hyd. Dan.* p. 110. *Ag. Sp. Alg.* vol. ii. p. 64.

Hutchinsia Agardhiana, *Ag. Sp. Alg.* vol. ii. p. 66.

Hutchinsia badia, *Ag. Syn.* p. 56. *Lyngb. Hyd. Dan.* p. 114. *Ag. Syst.* p. 155. *Ag. Sp. Alg.* vol. ii. p. 74.

Hutchinsia denudata, *Ag. Sp. Alg.* vol. ii. p. 73.

Conferva nigra, *Huds. Fl. Ang.* p. 595. *Dillw. Syn.* no. 162. *E. Bot.* t. 2340.

Conferva atro-rubescens, *Dillw.* t. 70.

Conferva badia, *Dillw. Syn.* no. 161. t. G.

Conferva denudata, *Dillw. Syn.* no. 160. t. G.

Hab. On rocks and stones in the sea, near low-water mark. Annual. Summer and autumn. Not uncommon.

Geogr. Distr. Atlantic coasts of Europe and North America. Falkland Islands, *Dr. Hooker*. Cape of Good Hope, *W. H. H.*

Descr. *Root* scutate. *Fronds* densely tufted, from three to twelve inches in length, as thick as hogs' bristle, gradually tapering to a capillary fineness, much or little branched; the main divisions once or twice forked, the rest of the branches alternate, very erect and mostly divided, long, and virgate, either naked, or more or less furnished with lateral secondary branches, which in luxuriant specimens bear a third series; all the branches set, at variable distances, with short, spine-like, very erect or appressed ramuli, 1–2 lines in length, which are at first simple, but finally become multifid, having, to the eye, a pencillate or tufted character. All the apices very much attenuated, when young, fibrilliferous. *Articulations* marked with numerous spiral tubes, the lower ones 2–3 times, the upper once and half as long as broad, the ultimate shorter than their breadth. *Siphons* twelve. *Capsules* very broad, with a wide mouth. *Tetraspores* small, always found in plants whose ramuli are most multifid or tufted. *Colour* a dark, full-red, becoming brownish, or even black in drying. Substance somewhat rigid, more or less firmly adhering to paper in drying.

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So long a string of synonyms seems to speak of a plant of very variable aspect. Yet the species here figured is tolerably constant to its characters, and much less variable than some others of the genus, about which botanists have had fewer differences. This plant has appeared under *four* names in the works of most authors; the first, *P. badia*, refers to the frond in a half-grown state; *P. atro-rubescens*, to the ordinary form of the full-grown plant; *P. Agardhiana*, to a luxuriant state of the frond, coupled with an imperfect state of capsular fruit; and *P. denudata*, to a battered and denuded state of the frond.

This species, under the name *Conferva nigra*, was first published by Hudson, whose character is sufficiently descriptive, and whose synonym is authenticated by specimens existing in the Herbaria of the late Sir T. Frankland and the Rev. H. Davies. It was afterwards figured by Dillwyn, as a new species, under the name *atro-rubescens*; a name subsequently given up by that author, on discovering the identity of his plant with the *nigra* of Hudson. Subsequent writers have, without exception, adopted *atro-rubescens* as the more descriptive of the two names, though not the most ancient.

Fig. 1. POLYSIPHONIA ATRO-RUBESCENS:—*of the natural size.* 2. Part of a branch, bearing a multifid ramulus. 3. Joints from the same. 4. Cross section. 5. Apex of a fertile stem, bearing capsules. 6. A ramulus, with its capsule. 7. A ramulus with tetraspores. 8. A tetraspore.
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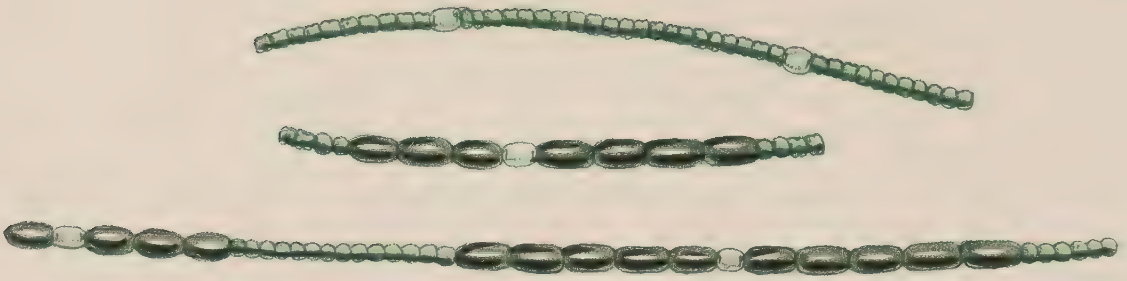
A.



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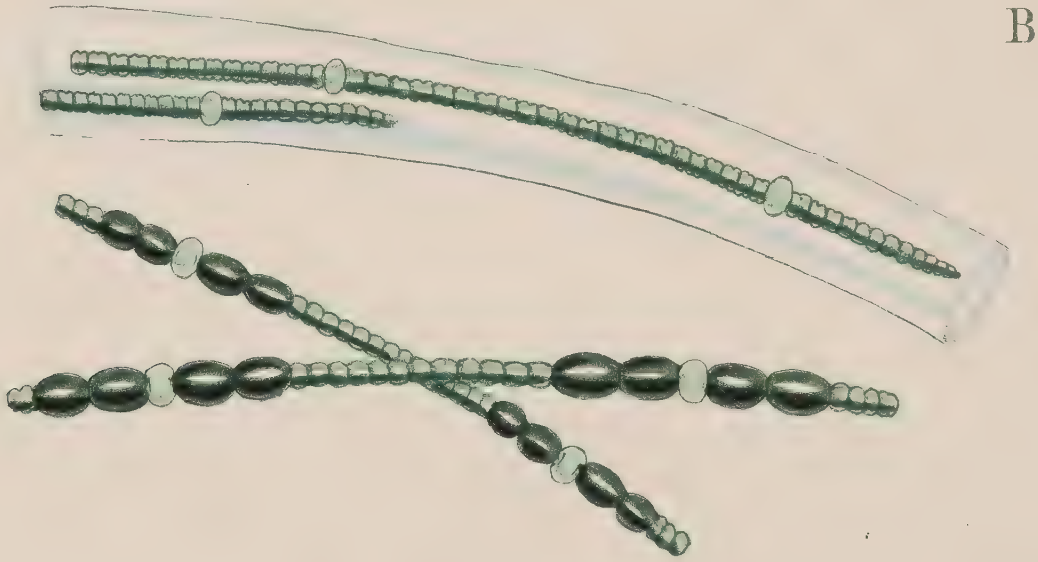

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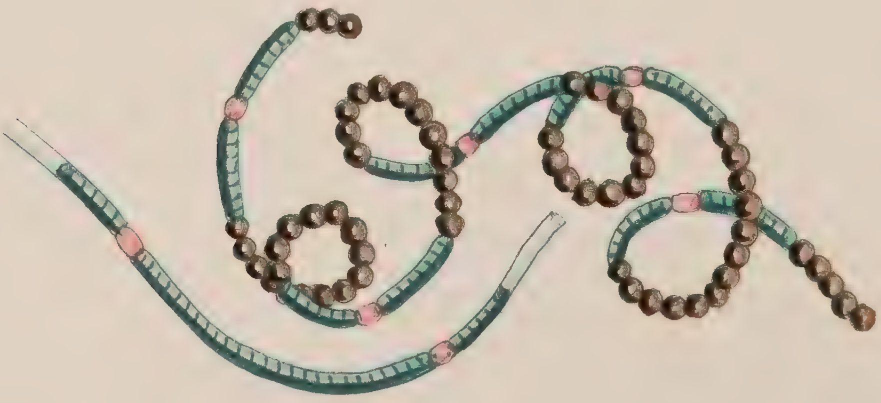

W. H. H. del et lith.

Reeve, Benham & Reeve, imp.

Plate CLXXIII. *A.*

SPHÆROZYGA BROOMEI, *Thw. MSS.*

Gen. Char. *Filaments* free, simple, moniliform, consisting of a series of ordinary cells, interrupted here and there by a cell of a different kind (*connecting cell* or *heterocyst*). *Spores* formed from the ordinary cells. Sphærozyga (*Ag.*),—from σφαιρα, a *sphere*, and ζυγος, a *yoke.*

Sphærozyga *Broomei*; "spores numerous, elliptical, twice as long as wide, not much exceeding in width the ordinary cells, commencing to be formed from the cells nearest the connecting cells: connecting cells smooth, subquadrate, rather longer than wide."—*Thw. MSS.*

Hab. On dead leaves of *Myriophyllum*, &c., in a brackish ditch at Shirehampton, near Bristol. June. *Mr. G. E. Broome*; *Mr. G. H. K. Thwaites.*

"A very distinct species, first detected by G. E. Broome, Esq., an excellent Cryptogamic botanist, after whom it is named."—*Thwaites.*

Fig. *A.* Filaments of Sphærozyga Broomei:—*magnified* 250 *linear.*

Plate CLXXIII. *B.*

SPHÆROZYGA BERKELEYANA, *Thw. MSS.*

Sphærozyga *Berkeleyana*; "Spores large, twice the width of the ordinary cells, oblong, half as long again as wide, becoming brown when mature, generally two on each side the connecting cell, which is sphæroidal, slightly compressed. Young filaments included, one or several together, in a defined, mucous sheath."—*Thw. MSS.*

Hab. Scattered amongst the filaments of *Conferva fracta*, &c., in a brackish ditch at Shirehampton, near Bristol. June. *Mr. G. H. K. Thwaites.*

"This fine species, which is named in honour of Rev. M. J. Berkeley, is interesting from the circumstance of its filaments, when young, being enclosed, often several together, in definite, gelatinous sheaths, out of which they appear to escape before the spores are mature. There are other species, occurring in fresh water, which exhibit the same peculiarity of structure, but it does not seem to have hitherto been noticed."—*Thw. MS.*

Fig. 1. Sphærozyga Berkeleyana; filaments:—*magnified* 250 *linear.*

Plate CLXXIII. *C.*

SPERMOSIRA HARVEYANA, *Thw. MS.*

Gen. Char. "Same as that of *Sphærozyga,* except that each filament is enclosed in a very delicate, membranous sheath."—*Thw.*

Spermosira *Harveyana*; "filaments much curved, composed of cells nearly as long as broad: spores exactly spherical, almost twice the diameter of the cells: connecting cells subquadrate, rather longer than wide, and of the same width as the ordinary cells."—*Thw.*

Hab. Occurring intermixed with *Sphærozyga Broomei,* at Shirehampton, near Bristol. June, 1847. *Mr. G. H. K. Thwaites.*

"This beautiful species differs from the *Spermosira litorea,* Kütz., figured in [our] Plate CXIII., in its spores being not at all compressed, and its ordinary cells much longer compared with their width. The membranous sheath investing the filament is with difficulty seen, and the plant bears considerable resemblance to some species of *Sphærozyga.* The curved filaments and spherical spores render it not very unlike *Monormia intricata,* Berk., from which it is, however, perfectly distinct"—*Thw. MS.*[*]

Fig. 1. *C.* Spermosira Harveyana:—*magnified* 250 *linear.*

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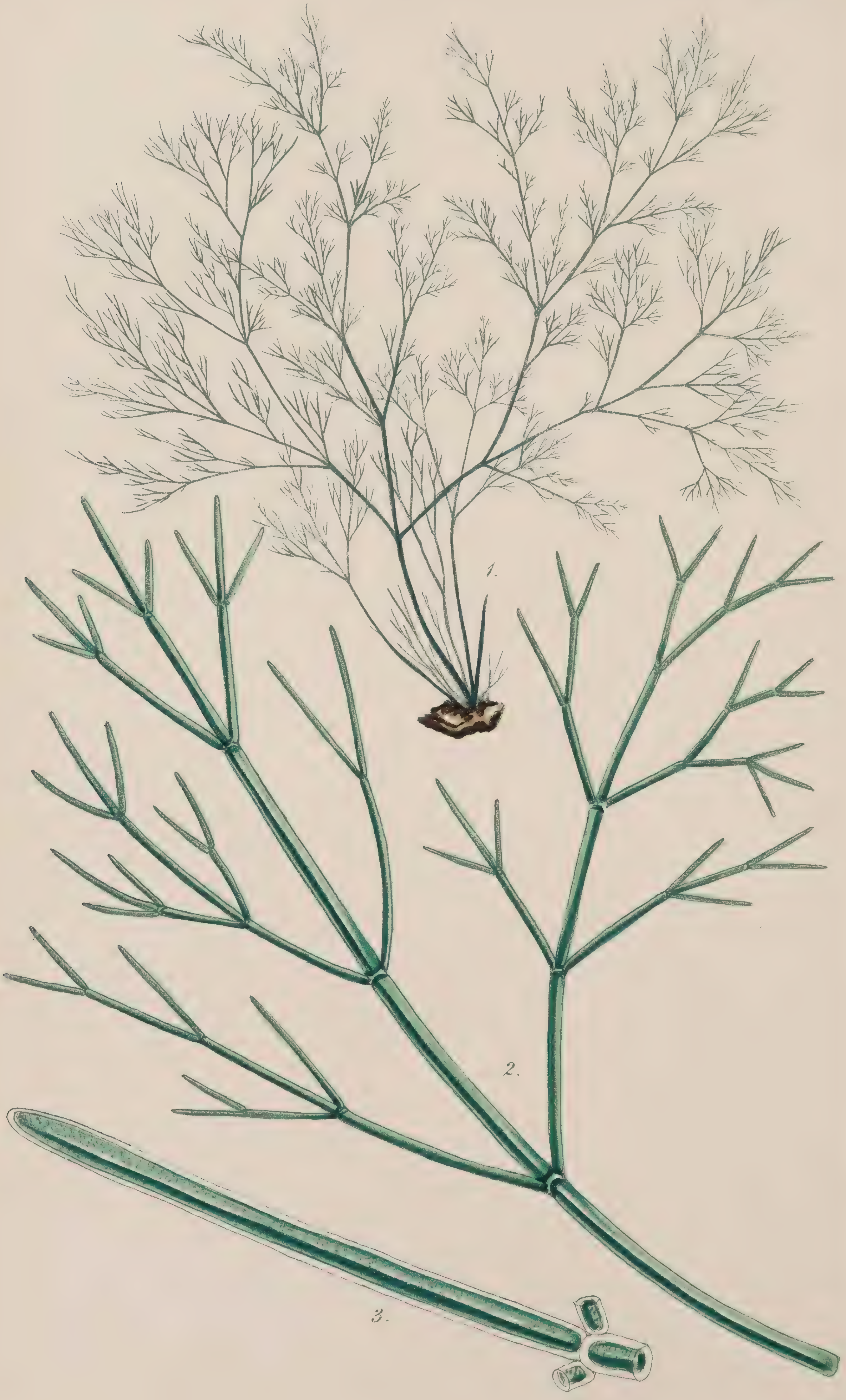
[*] I am indebted to my friend G. H. K. Thwaites, Esq., of Bristol, for the drawings copied in Plate CLXXIII., and the accompanying descriptive characters. I have also to return him my thanks for the honour he has done me in naming the *Spermosira*; but especially for the hearty expressions which accompanied the "*patent.*" Writing to congratulate me on a recent appointment, after the kindest expressions, he concludes by saying, "Do let me, in honour of the occasion, call the beautiful new *Spermosira,* of which I have just sent you a sketch, *S. Harveyana,* and thus pay the first tribute of respect, of this kind, to you in your new capacity."



W. H. H. del et lith.

Reeve, Benham & Reeve imp.

PLATE CLXXIV.

CLADOPHORA PELLUCIDA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit,* aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*), —from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *pellucida*; filaments rigid, erect, setaceous, full dark-green, di-tri-chotomous; the axils very acute, the branches erect; articulations many times longer than broad; dissepiments only at the forking of the branches and ramuli.

CLADOPHORA pellucida, *Kütz. Phyc. Gen.* p. 271.

CONFERVA pellucida, *Huds. Fl. Ang.* p. 601. *Dillw. Conf.* t. 90. *E. Bot.* t. 1716. *Ag. Syst.* p. 120. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 193. *J. Ag. Alg. Medit.* p. 13. *Harv. Man.* p. 135.

HAB. On the bottoms and sides of deep rock-pools, between tide marks, generally near low-water mark; not left dry at low water. Annual? Summer. Not uncommon on the shores of England and Ireland.

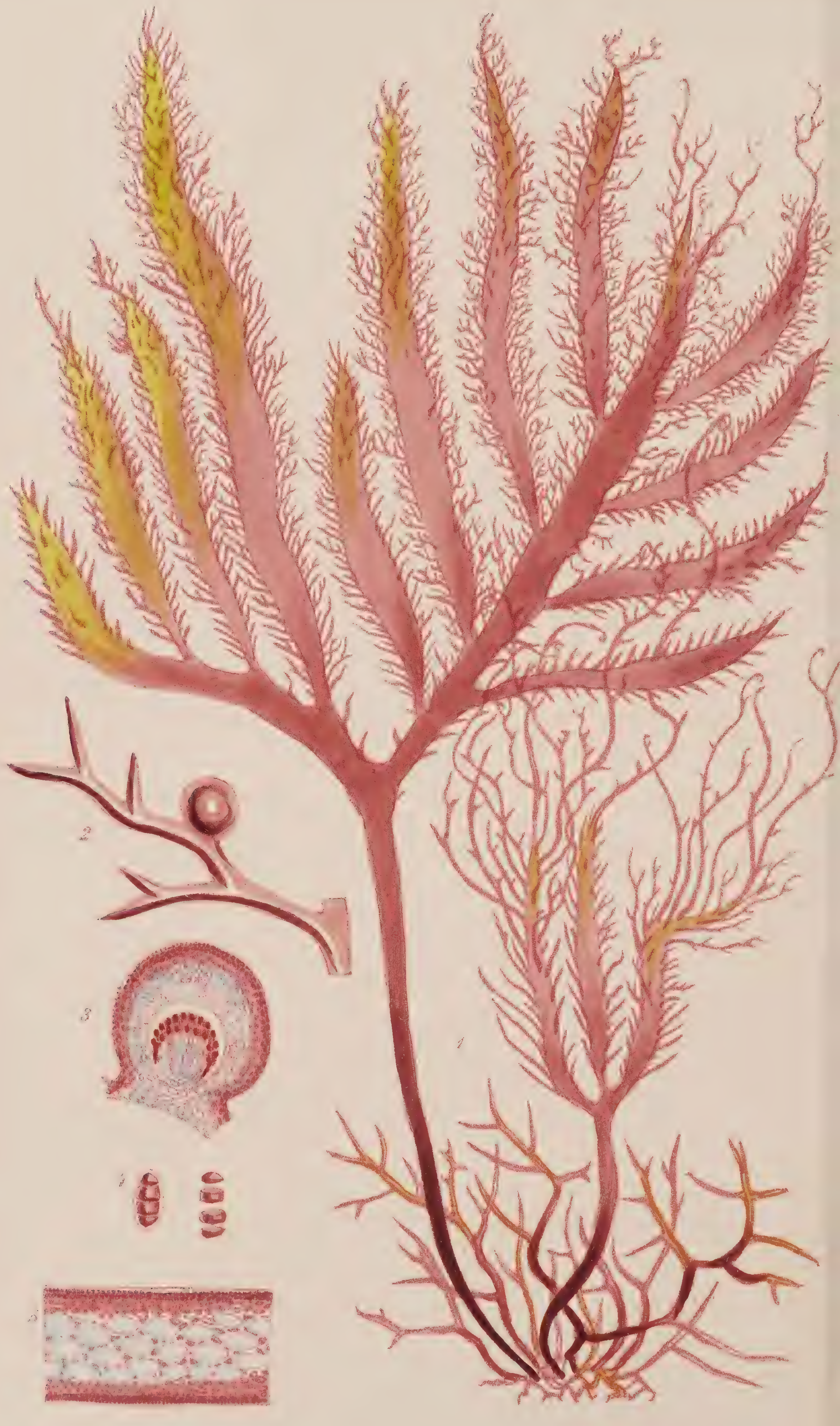
GEOGR. DISTR. Atlantic shores of Europe and America. Mediterranean Sea. Cape of Good Hope, *W. H. H.*

DESCR. *Root* scutate, firmly attached to the rock. *Filaments* from three to six or eight inches high, thicker than hogs' bristle, tufted, or subsolitary, extremely rigid, almost wiry, tough and strong, rising with an undivided stem to the height of an inch or more, then either forked or trifurcate, and afterwards repeatedly branched, at short intervals, in a dichotomous or trichotomous manner, some specimens being nearly constantly trichotomous, others dichotomous, and others exhibiting a combination of these methods of branching. Besides this regular ramification, old and luxuriant specimens frequently emit from the forkings, or axils, accessory ramuli more slender than the cells they spring from, but branching in the same manner. Occasionally these are very numerous and densely tufted. *Articulations* one to each *internode* of the branches, many times longer than broad, cylindrical, filled with dense fluid matter, which is usually dissipated in drying, when the plant fades to a pale green, preserving a somewhat glazed lustre, like that of *Bryopsis*. In drying it adheres very imperfectly to paper.

It is pleasant in such a genus as *Cladophora*, where the species often seem to run insensibly into one another, to find one so broadly distinguished from the rest that there can be no mistake about it. The plant here figured is just of this character. *Cladophora pellucida* may at once be known by its very distinct di-trichotomous branching, and by there being but a single articulation or *cell* in the space intervening between each furcation; that is to say, every *internode* consists of a single cell. There is no other British species in which this takes place regularly, in all parts of the frond. It thus happens that the individual *cells,* in this species, are of extraordinary length, those of the lower parts of the filament being sometimes more than an inch in length, very frequently three quarters of an inch.

Conferva pellucida was first described by Hudson, in the Flora Anglica, and has been adopted by all subsequent authors with the exception of Lyngbye, who unaccountably confounds it with *C. rupestris,* a plant which is well distinguished by the difference in its articulations, if there be no other character, as there are many, to separate it. Hudson's expression "*articulis cylindricis longissimis,*" is alone characteristic of *C. pellucida.*

Fig. 1. CLADOPHORA PELLUCIDA:—*of the natural size.* 2. Portion of a branch:—*magnified.* 3. Terminal articulation of the same:—*more highly magnified.*



W. H. H. del et lith.

Reeve, Benham & Reeve

PLATE CLXXV.

RHODYMENIA JUBATA, *Grev.*

GEN. CHAR. *Frond* flat, membranaceous or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick, cellular pericarp, containing a mass of minute spores on a central placenta. 2, *tetraspores*, either zoned or triparted, imbedded among the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA (*Grev.*),—from ροδεος, *red*, and υμην, a *membrane*.

RHODYMENIA *jubata*; frond thickish, flaccid, subcartilaginous, dull-red, linear-lanceolate, much attenuated or cirrhose at the apex, vaguely pinnate with laciniæ of the same form; the margins, and often the disk, beset with subulate or filiform cilia, in which both tubercles and tetraspores are produced on distinct plants; root fibrous, branching.

RHODYMENIA jubata, *Grev. Alg. Brit.* p. 91. *Hook. Br. Fl.* vol. ii. p. 291. *Wyatt, Alg. Danm.* no. 18. *Harv. in Mack. Fl. Hib.* part 3, p. 194. *Harv. Man.* p. 63. *J. Ag. Alg. Medit.* p. 153. *Endl. 3rd Suppl.* p. 51.

CALLIBLEPHARIS jubata, *Kg. Phyc. Gen.* p. 404.

SPHÆROCOCCUS jubatus, *Grev. Scot. Crypt.* t. 359.

SPHÆROCOCCUS ciliatus, vars. jubatus, linearis, angustus, and spinosus, *Ag. Sp. Alg.* vol. i. p. 264. *Ag. Syst.* p. 221.

FUCUS jubatus, *Good. and Wood. Lin. Trans.* vol. iii. p. 162. t. 17. *Stack. Ner. Brit.* p. 51. t. 11.

FUCUS ciliatus, vars. jubatus, lanceolatus, angustus, and spinosus, *Turn. Hist.* t. 70. fig. *f–h.*

HAB. On the bottoms of rock-pools between tide marks, chiefly near low-water mark; also among the roots of *Laminaria digitata*. Annual. Fruiting in summer. Frequent on the shores of the British islands from Orkney to Cornwall, and Jersey.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* composed of densely matted, branching fibres. *Fronds* densely tufted, very variable in form. They all rise with a cylindrical stem which is from one to five or six inches in length, becoming gradually wider and more compressed upwards and expanding into a flat, linear-lanceolate, very narrow, simple or forked frond, which is much drawn out at the apex, and more or less regularly pinnate with laciniæ resembling itself. These *pinnæ* are often secund; and often very irregularly placed. Their margins and disk are more or less densely clothed with filiform cilia from 1–2 lines to an inch or more in length, branching or simple; in some varieties produced into cirrhi 3–6 inches long or more, which clasp round each other and round neighbouring Algæ in a very entangled manner. Sometimes the whole frond is cylindrical, much and irregularly branched; the branches spreading and set with spine-like ramuli. *Tubercles* spherical, sessile on the sides of the cilia. *Tetraspores* contained in the cilia, oblong, transversely zoned. *Substance* cartilaginous, but flaccid, soon altering in fresh water. *Colour* a dull red, which quickly becomes orange in fresh water, and changes to brownish in drying; in which state the plant, if placed under pressure, adheres to paper, but shrinks considerably.

* * *

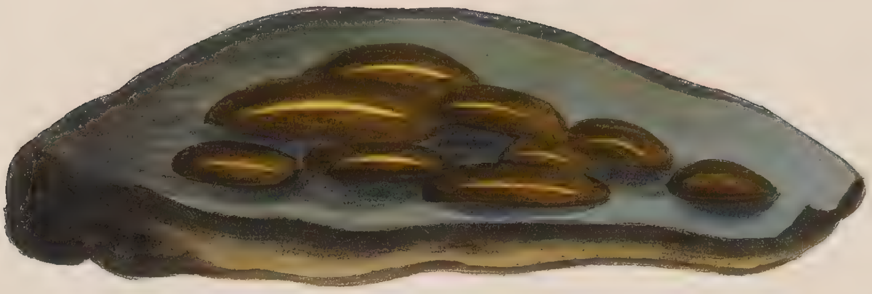
This species, first distinguished by Micheli, received the specific name which it now bears from Messrs. Goodenough and Woodward, who described it in their memoir on the species of *Fucus* in the Linnæan Transactions. Mr. Turner in his Synopsis, and subsequently in his great work, regards it as merely a variety of *R. ciliata*, to which species, no doubt, it is very closely allied. Mrs. Griffiths, however, clearly points out characters by which they may be distinguished, namely, the more flaccid substance and duller colour of *R. jubata*, and the different position of the *tetraspores*, these being in the present species confined to the cilia, and in *R. ciliata* immersed in the laciniæ of the frond. To this may be added that *R. ciliata* is a winter plant, and *R. jubata* in perfection in summer.

The *tubercles* of this species are rare. I have only gathered them in a locality at Miltown Malbay (in rock-pools opposite "Billowville"), but in that station I found them abundantly, first in 1831, afterwards in 1847. The plant is common on most of the British shores, but scarcely ever found with *tubercles*.

Few plants are more sportive in appearance. Our plate represents some of the more common forms: but specimens are often found in which the cilia are much more copiously developed, or where the whole frond is exceedingly slender, filiform, and entangled. Such examples may at first sight be mistaken for luxuriant tufts of *Gigartina acicularis*.

Fig. 1. RHODYMENIA JUBATA; fronds:—*of the natural size.* 2. A cilium, with tubercle. 3. Vertical section of a tubercle. 4. Tetraspores. 5. Section of the frond:—*all more or less magnified.*

Plate [illegible]



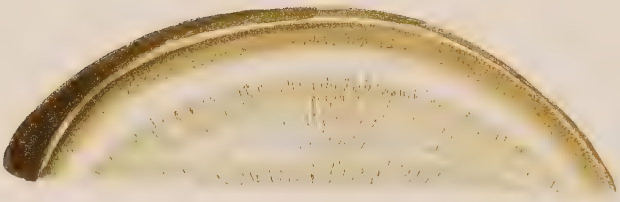


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PLATE CLXXVI.

LEATHESIA BERKELEYI, *Harv.*

GEN. CHAR. *Frond* globose or lobed, fleshy, composed of jointed, colourless, dichotomous filaments, issuing from a central point; their apices, which constitute a fleshy coating to the frond, coloured and tufted. *Fructification*; oval *spores*, attached to the coloured tips of the filaments. LEATHESIA (*Gray*),—in honour of the Rev. Mr. Leathes, a British naturalist.

LEATHESIA *Berkeleyi*: fronds dark brown, depressed, fleshy, solid; filaments densely packed.

CHÆTOPHORA Berkeleyi, *Grev. in Berk. Gl. Alg.* t. 1. fig. 2. *Harv. in Hook. Br. Fl.* vol. ii. p. 390. *Wyatt, Alg. Danm.* no. 231. *Harv. Man.* p. 123.

HAB. On submarine rocks, between tide marks; exposed at low water. Annual. Summer. Torquay, *Rev. M. J. Berkeley.* Tor Abbey rocks, *Mrs. Wyatt.* Rocks at Kilkee, Co. Clare (1833); Miltown Malbay; and Valentia, Kerry, *W. H. H.*

GEOGR. DISTR. South of England and West of Ireland.

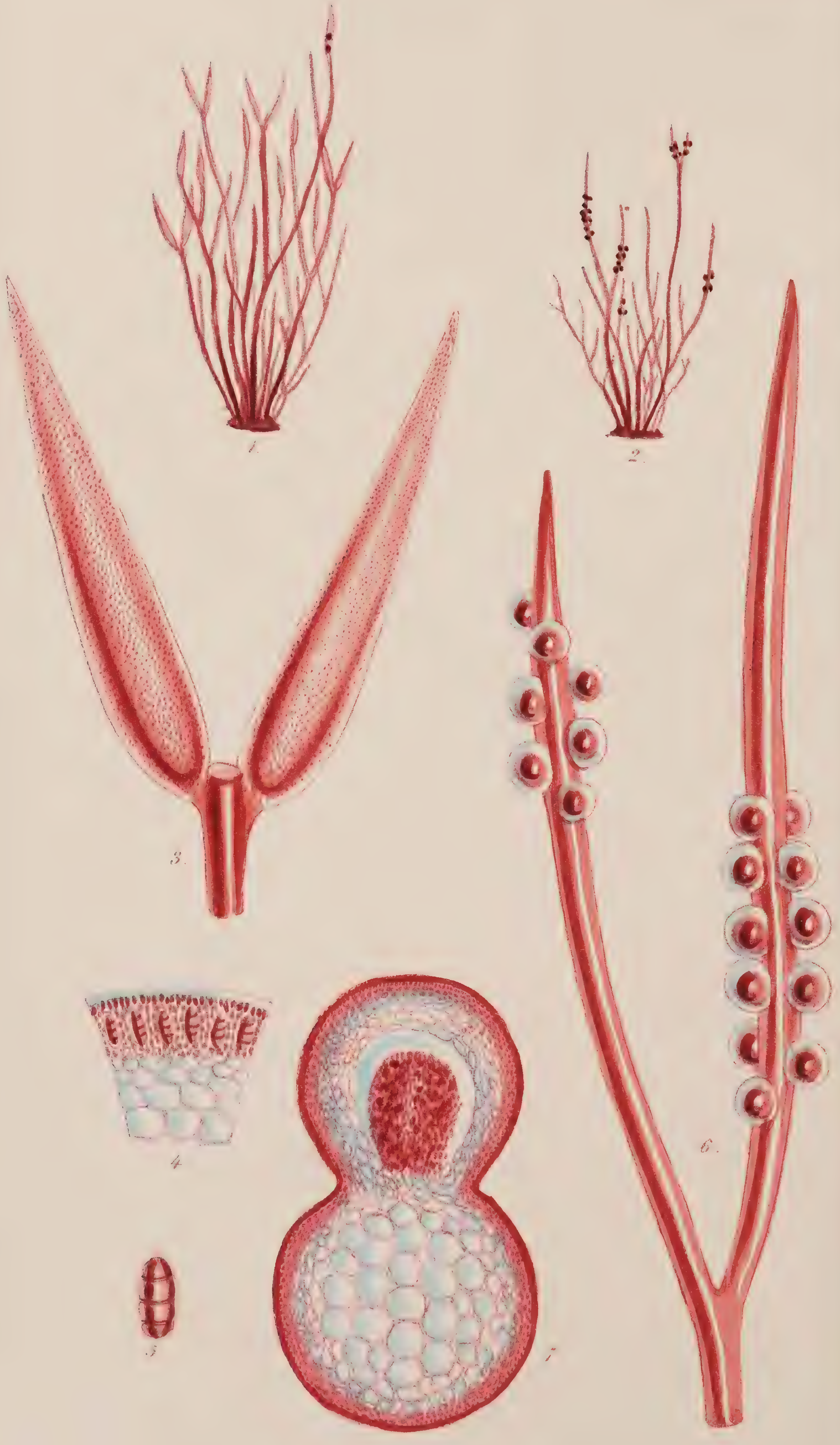
DESCR. *Fronds* gregarious, one or two inches in diameter, from a quarter to half an inch in thickness, convex, but depressed, irregular in form, dark brown, fleshy, soft, somewhat elastic, not gelatinous to the touch, *solid* at all periods of its growth. *Filaments* very densely packed, dichotomous, composed of three kinds of cells; the cells of the lower part cylindrical or slightly pyriform, several times longer than their diameter; those of the middle portion bead-like, oval, partially coloured; those of the terminal branchlets, which are irregularly branched and densely compacted together, very short and full of dark-olive endochrome. *Fruit* unknown. In drying, the plant shrinks considerably, and partially adheres to paper.

A small plant, more curious than beautiful, first noticed by the Rev. M. J. Berkeley on rocks at Torquay, from which locality I have received specimens gathered by Mrs. Griffiths and Mrs. Wyatt. On the west coast of Ireland it is plentiful in several places and probably is pretty generally distributed along our shores, being overlooked on account of its being often nearly of the colour of the rock on which it grows, and resembling, in its fleshy appearance and feel, the collapsed body of the common *Actinia.* The Irish specimens (from which, in a living state, our figure is taken) appear to be identical with those published by Mrs. Wyatt, and agree very well with the description of the plant given by Mr. Berkeley, so far as outward resemblance may be trusted. But the magnified figure of that author is very unlike that now given; nor have I been able to detect the long diaphanous points to the filaments which he describes. Still I am inclined to regard our plants as identical.

From the common *Leathesia tuberiformis* (*Corynephora marina*, Ag. and Brit. Fl.), *L. Berkeleyi* differs in being at all times of a dense and solid substance (not, as *L. tuberiformis*, at first flocculent within, and then hollow), in its different colour, and more depressed form. In all the essential characters, if my analysis, made from the recent plant, may be depended on, the two plants agree in structure. I therefore remove *L. Berkeleyi*, which was at first placed in *Chætophora*, to the present genus. The name *Corynephora* under which these plants have been hitherto known to British botanists must be laid aside, being too like, both in sound and sense, to *Corynephorus*, Palis., a genus of Grasses; and that now revived was proposed for the typical species in 1821, three years earlier than Agardh applied *Corynephora* to it.

Fig. Leathesia Berkeleyi; cluster of fronds:—*of the natural size.* 2. Vertical section of a frond:—*moderately magnified.* 3. Some of the filaments of which it is composed:—*highly magnified.*

Plate CLXXV



W.H.H. del et lith.

Reeve Benham & Reeve, imp.

PLATE CLXXVII.

GRACILARIA ERECTA, *Grev.*

GEN. CHAR. *Frond* filiform, or rarely flat, carnoso-cartilaginous, continuous, cellular; the central cells very large, empty or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface.

GRACILARIA *erecta*; fronds numerous from a common disk, short, erect, cylindrical, sparingly dichotomous; branches subsimple; tubercles globose, clustered; tetraspores contained in terminal, lanceolate, pod-like ramuli.

GRACILARIA erecta, *Grev. Alg. Brit.* p. 124. t. 14.

PLOCARIA erecta, *Endl. 3rd Suppl.* p. 51.

GIGARTINA erecta, *Hook. Br. Fl.* vol. ii. p. 300. *Wyatt, Alg. Danm.* no. 115. *Harv. Man.* p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 200.

SPHÆROCOCCUS (?) erectus, *Grev. Crypt.* t. 357.

HAB. On sand-covered rocks near low-water mark; also in 4–5 fathom water. Perennial. Fruiting in winter. Very rare. Sidmouth and Torquay, *Mrs. Griffiths.* Belfast Bay, *Mr. W. Thompson.* Port Ballantrae, *Mr. D. Moore.* Roundstone, *Mr. Mc Calla.* Orkney, *Rev. J. H. Pollexfen, Lieut. Thomas, and Dr. Mc Bain.*

GEOGR. DISTR. Coast of France.

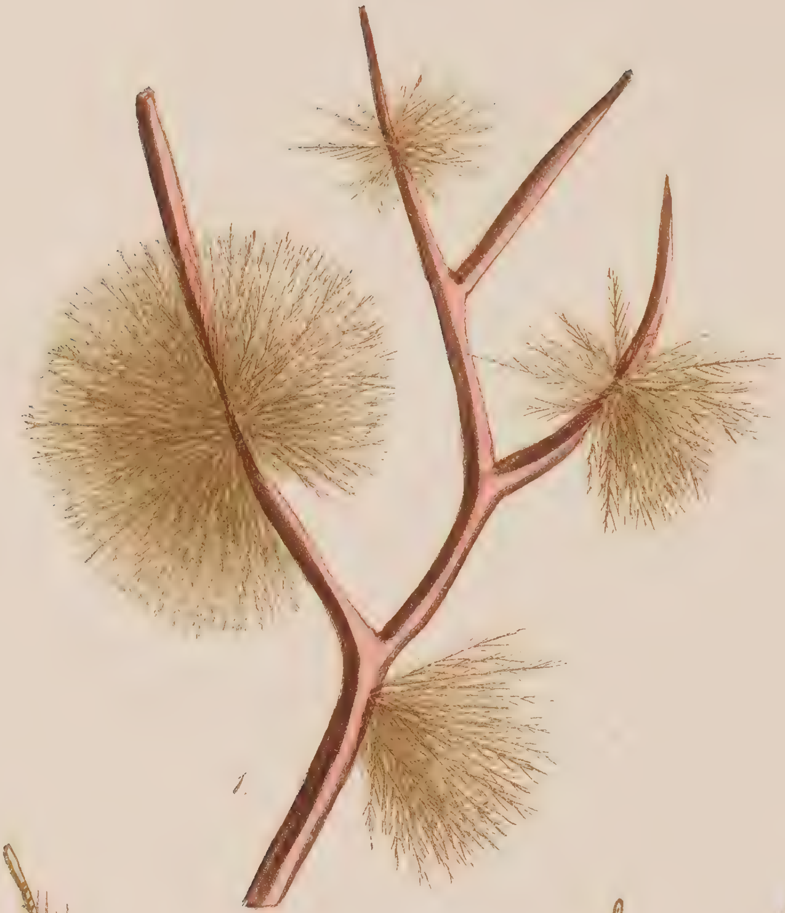
DESCR. *Root* a flat, thin disk, spreading on the rock. *Fronds* numerous from the same base, from two to four inches high, seldom so much, cylindrical, filiform, erect, twice as thick as hog's bristle, irregularly branched; sometimes simple for their greater length, forked at the apex; sometimes twice or thrice forked; sometimes furnished with a few lateral branches. *Branches* mostly simple, long, naked, often flexuous, tapering to a fine point. *Tubercles* sphærical, very prominent, densely clustered on the branches, often near the tips, containing, under a thick, cellular coating, a large central mass of minute spores. *Tetraspores* contained in lanceolate, terminal *pods* or swollen ramuli, which are mostly in pairs; oblong, transversely parted. *Colour* a more or less deep red, becoming darker in drying. *Substance* cartilaginous, somewhat rigid. It does not adhere, or but very imperfectly, to paper in drying.

⁂

A curious and elegant little plant, scarcely known out of England, and one of the discoveries of Mrs. Griffiths, to whom it has long been familiar under the manuscript name *suffocatus*;

a name designed to express a peculiarity of growth, its favourite habitat being the flat bottoms of shallow rock-pools, where it is generally half buried in sand. Dr. Greville, who first described and figured it in his Cryptogamic Flora, gave it the name *erectus*, from another of its distinguishing characters, the peculiarly upright and rigid frond. When in perfect fructification it is easily recognised; the clustered tubercles and the lanceolate pod-like tips being both very striking characteristics. But barren specimens are exceedingly like, except in colour, young plants of *G. confervoides*, from which their greater simplicity, and more rigid substance, and erect growth, alone distinguish them. It is proper to mention that the Orkney specimens above noticed are without fruit; and, therefore, notwithstanding the perfect resemblance of their frond to Devonshire individuals, some doubt may rest upon their identity. In my own judgement they *do* belong to this species; but I am informed that another very competent authority is not satisfied; nor until fertile plants shall have been procured is it possible to determine which opinion is correct. The French specimen, communicated by M. Lenormand, is also barren, and is therefore equally doubtful.

Fig. 1. GRACILARIA ERECTA, with *pods*. 2. With *tubercles*:—*both of the natural size*. 3. Pods. 4. Transverse section of the surface of a pod, showing imbedded tetraspores. 5. A tetraspore. 6. Branches with tubercles. 7. Transverse section of a branch and a tubercle:—*all more or less magnified*.



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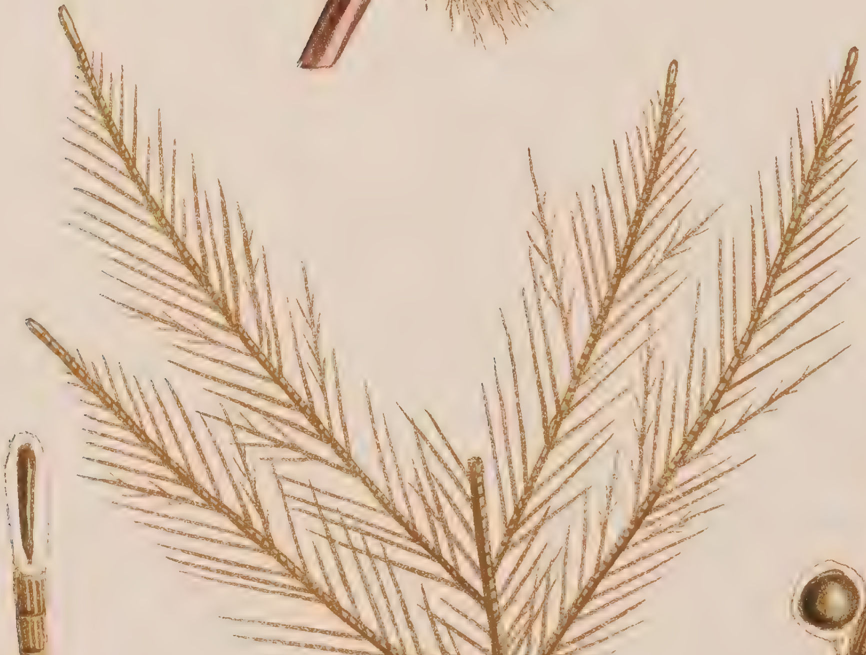

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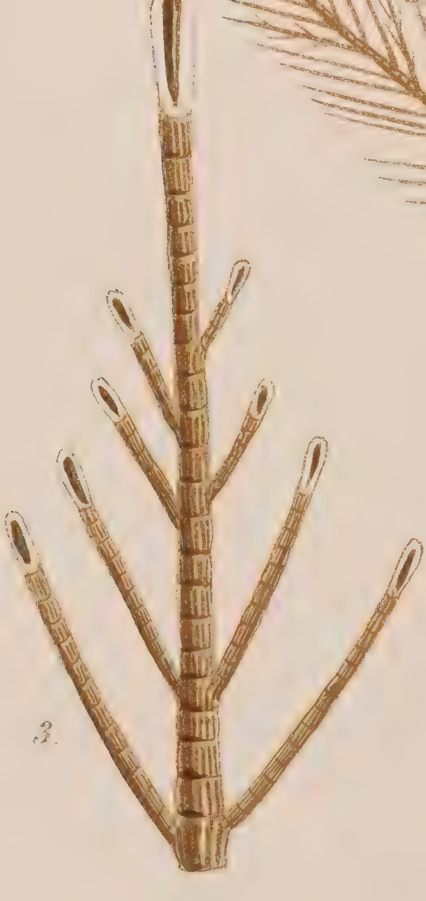

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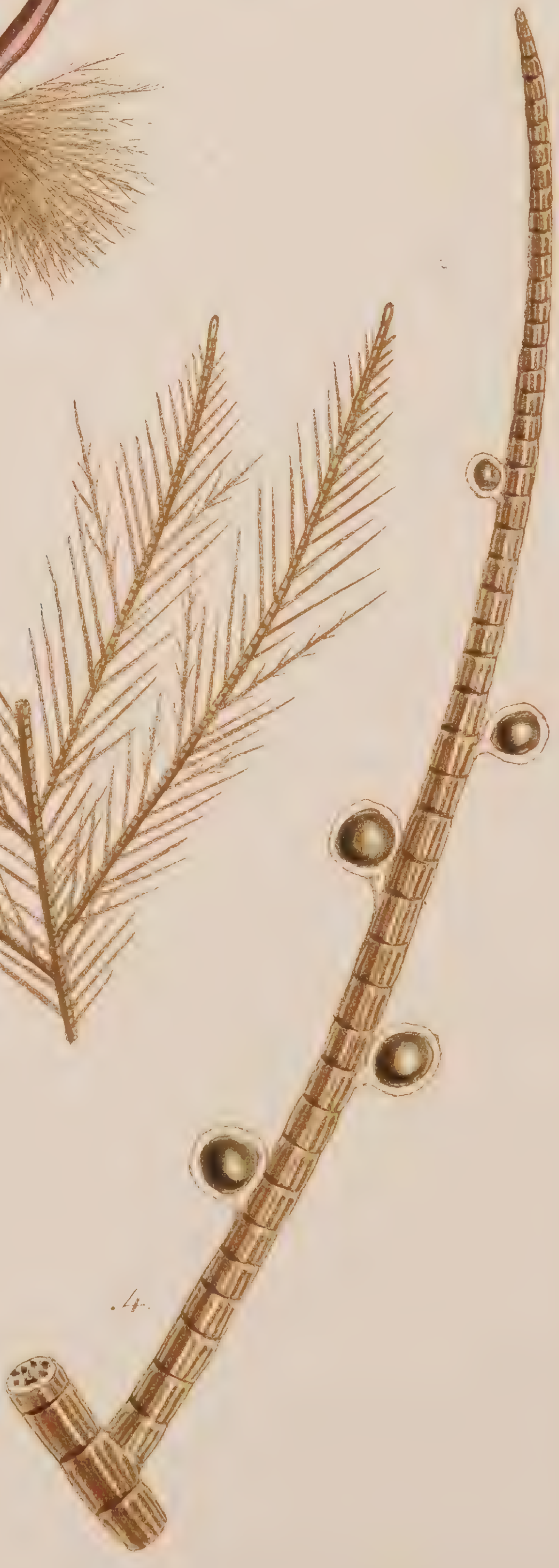


4.

W. H. H. del et lith.

Reeve Benham & Reeve, imp

PLATE CLXXVIII.

SPHACELARIA CIRRHOSA, *Ag.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles* (or *spores*), borne on the ramuli. SPHACELARIA (*Lyngb.*), from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *cirrhosa*; parasitical; filaments naked at the base, short, densely tufted, simple or branched, jointed throughout; stem, or branches, pinnate; pinnæ opposite, alternate, or irregular, of unequal length; utricles sessile or shortly stalked, scattered, globose.

SPHACELARIA cirrhosa, *Ag. Syst. Alg.* p. 164. *Ag. Sp.* vol. ii. p. 27. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Wyatt, Alg. Danm.* no. 171. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 38. *J. Ag. Alg. Medit.* p. 29. *Endl. 3rd Suppl.* p. 24. *Grev. Crypt.* t. 317. *Kg. Phyc. Gen.* p. 292.

SPHACELARIA pennata, *Lyngb.* p. 105. t. 31. (excl. var. β.)

CERAMIUM cirrhosum, *Hook. Fl. Scot.* part 2. p. 86.

CONFERVA marina perbrevis villosa et cirrhosa, *Dill. Musc.* t. 4. f. 21.

CONFERVA cirrhosa, *Roth. Cat.* vol. ii. p. 214. vol. iii. p. 294.

CONFERVA intertexta, *Roth. Cat.* vol. i. p. 188. t. 3. f. 5.

CONFERVA pennata, *Huds.* p. 604. *Dillw.* t. 86. *E. Bot.* t. 2330 (*right-hand figure*). *Fl. Dan.* t. 1486. f. 2.

HAB. Parasitic on the smaller Algæ, between tide marks. Perennial? Summer. Very common.

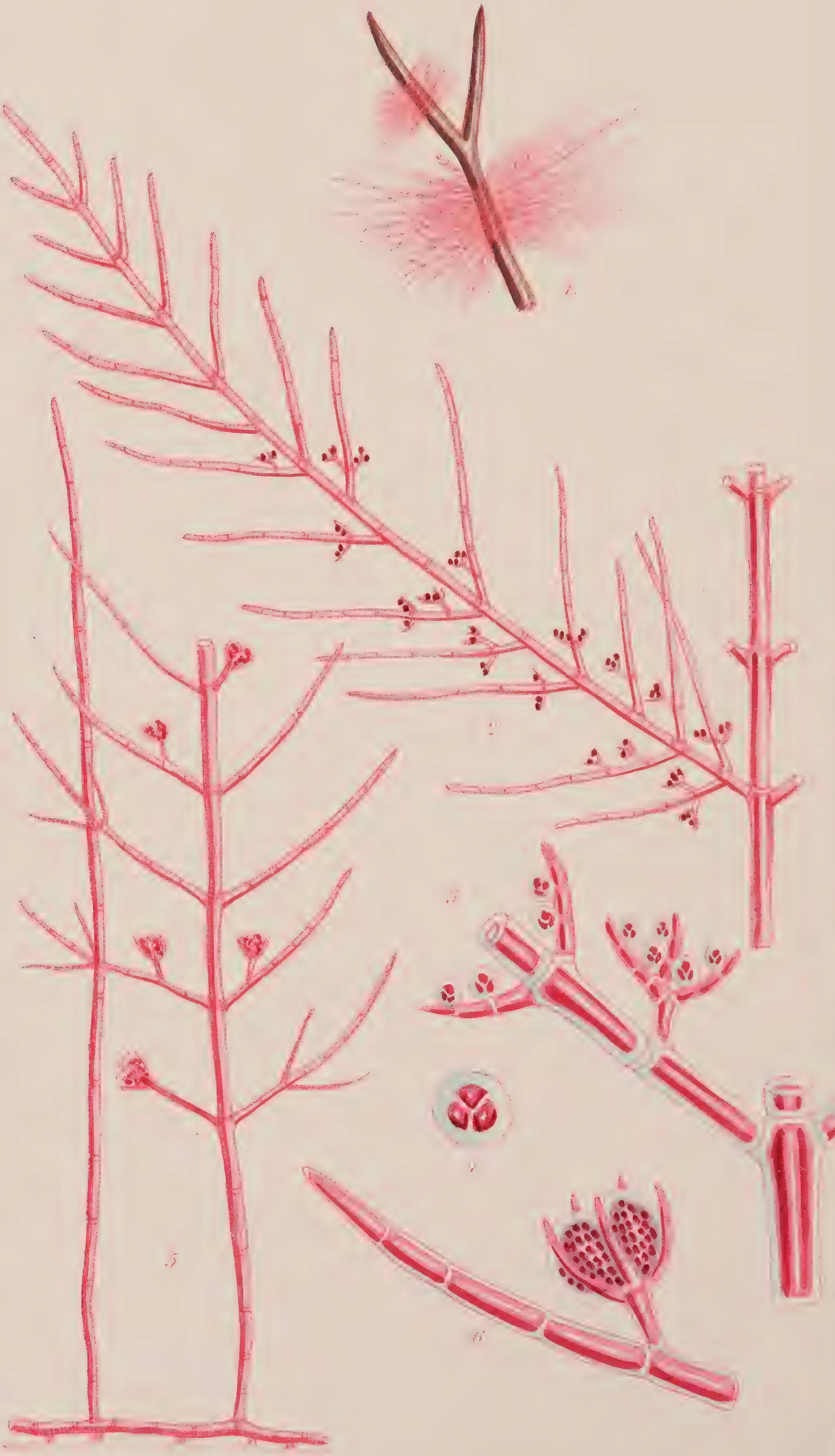
GEOGR. DISTR. Abundant on the Atlantic and Mediterranean shores of Europe.

DESCR. *Filaments* from a quarter of an inch to one or two inches in length, slender, forming globose, dense tufts, very variable in the amount of ramification. Some of the smaller varieties are but slightly branched, the branches irregularly pinnate. In others the main filament is repeatedly divided, the branches closely set, spreading, short in the lower part of the frond, elongated above, once or twice pinnate. *Pinnæ* closely set, opposite or alternate, erect or spreading, mostly simple and naked, sometimes pinnulated, very irregular in length, but gradually becoming shorter to the tips, slightly tapering. *Apices* frequently sphacelate. *Joints* visible in all parts of the stem and branches, at distances asunder equal to about the diameter of the frond, longitudinally striate. *Utricles* globose, scattered along the pinnæ, either sessile or raised on short stalks. *Colour* olive; becoming a foxy brown in age. *Substance* rigid, not adhering to paper in drying.

Here we have a very common and very variable plant, which puts on several distinct looking forms, according to the locality in which it may grow; but, on a careful examination of numerous specimens of these varieties now before me, I cannot fix on any characters which appear of specific value. My friend Mr. Hore finds that the utricles or spores of the small variety which commonly grows on *Desmarestia aculeata* are borne on little stalks, while in the common form represented in our plate they are mostly sessile; and this character, were it constant, would afford a readily appreciable mark of distinction. But when making the sketch for the magnified ramulus (fig. 4) taken, without selection, from a specimen of the common form, I observed that though the spores are often nearly sessile, there is frequently a short pedicel. And when any disposition to form a pedicel exists in so variable a plant as this, its amount must be most uncertain. The spore is to be regarded morphologically as an abbreviated ramulus; where the *whole* ramulus is converted into a spore, that organ will be sessile; but when a part only is so changed, it will be stalked.

This species was once confounded with *S. plumosa*, but differs from that beautiful plant in habit and size, in its jointed main filaments, and in being far less regularly pectinato-pinnated, with proportionally shorter pinnules. Being a very common plant, it was among the first of the genus observed by botanists, and is figured in the Historia Muscorum of Dillenius, under the specific name here preserved. By Hudson it was subsequently called *pennata*, a name adopted by succeeding authors until the older one was restored by Roth.

Fig. 1. SPHACELARIA CIRRHOSA; tufts:—*of the natural size.* 2. Part of the stem and pinnated branches. 3. Apex of a branch with ramuli. 4. Ramulus with utricles.



W. H. H. del. et lith.

Reeve, Benham & Reev

PLATE CLXXIX.

CALLITHAMNION TURNERI, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opake and cellular, or translucent and jointed, branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores,* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from καλος, *beautiful,* and θαμνιον, a *little shrub.*

CALLITHAMNION *Turneri*; filaments rising from creeping fibres, simple or repeatedly branched, once or twice pinnated with opposite, spreading simple ramuli; articulations of the main filaments 5–10 times longer than broad; tetraspores clustered, subracemose or corymbose, favellæ involucrated, stalked.

CALLITHAMNION Turneri, *Ag. Syst. Alg.* vol. ii. p. 100. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Wyatt, Alg. Danm.* no. 183. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 114. *J. Ag. Alg. Medit.* p. 70. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 373.

CALLITHAMNION repens, *Lyngb. Hyd. Dan.* p. 128. t. 40. *Ag. Spec. Alg.* vol. ii. p. 184. *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. in Mack. Fl. Hib.* part 3. p. 218. *Harv. Man.* p. 115. *Kütz. Phyc. Gen.* p. 372.

CALLITHAMNION variabile, *Ag. Sp. Alg.* vol. ii. p. 163? *Kütz. Phyc. Gen.* p. 372.

CERAMIUM Turneri, *Roth. Cat.* vol. iii. p. 128. t. 5. *Ag. Syst.* p. 142. *Grev. Crypt.* t. 355.

CERAMIUM repens, *Ag. Syn.* p. 63. *Ag. Syst.* p. 131.

CONFERVA Turneri, *Dillw.* t. 100. *E. Bot.* t. 2339 (*not.* t. 1637).

CONFERVA repens, *Dillw.* t. 18. *Roth. Cat.* vol. iii. p. 221. *E. Bot.* t. 1608. *Fl. Dan.* t. 1665.

CONFERVA tenella, *Dillw. Syn.* p. 72. t. F.

HAB. Parasitical on other Algæ, between tide marks. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea.

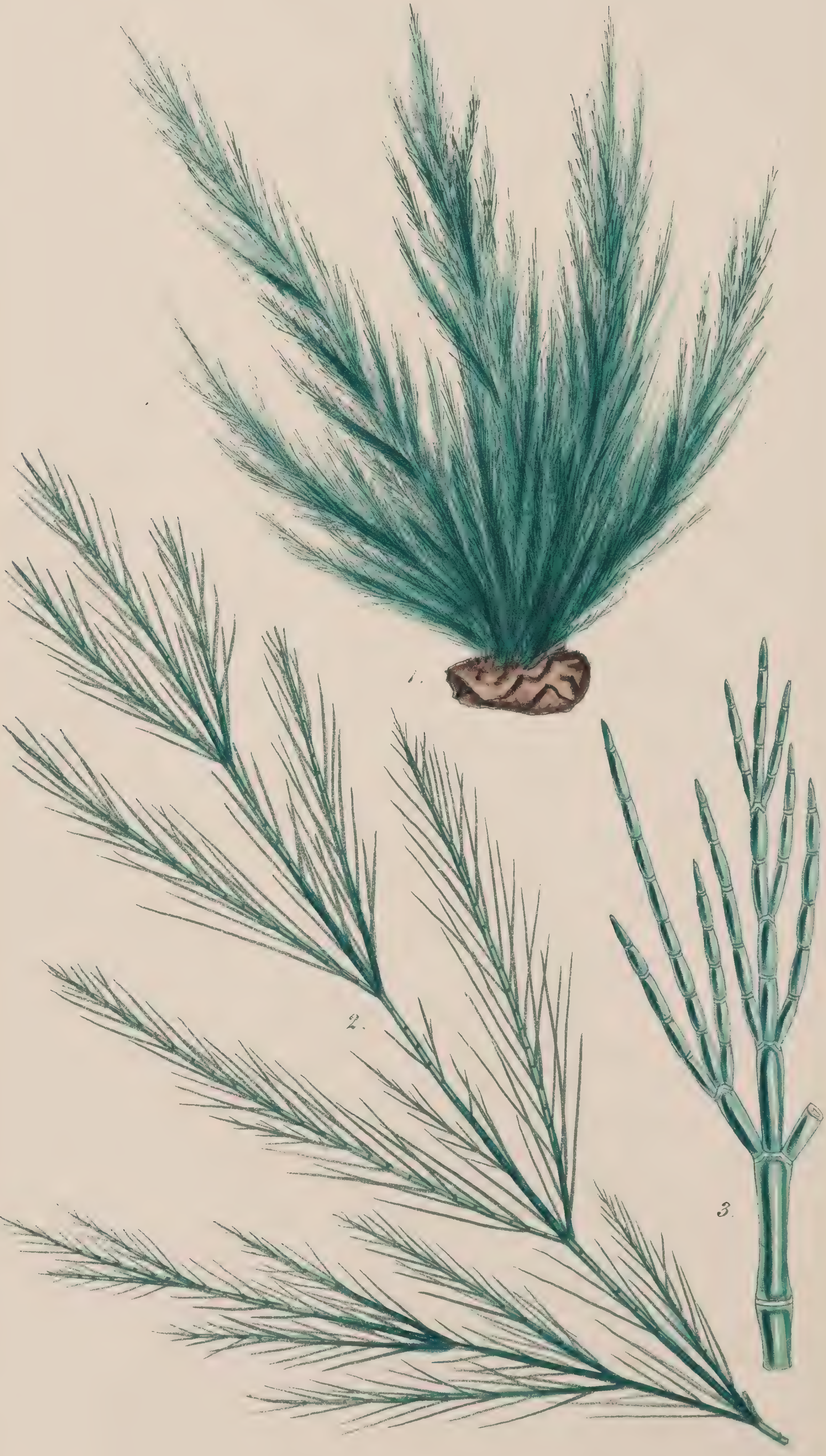
DESCR. *Filaments* rising from numerous prostrate fibres which creep, by means of small, discoid roots, over the surface of other plants, densely tufted, one to two inches high, capillary, simple or repeatedly branched; the branches very generally opposite, sometimes alternate, spreading, pinnated or bipinnated with simple, slender, elongated, patent, opposite, or rarely alternate ramuli. *Articulations* of the main stem from five to ten times longer than broad; those of the ramuli 4–5 times; all with a narrow endochrome, bordered by a wide hyaline coat. *Dissepiments* broad. *Tetraspores* globose, with wide margins, sessile on the sides of short, simple, or branched peduncles, which rise from the ramuli near their base. *Favellæ* mostly bilobed, involucrate, borne on lateral peduncles, or terminating shortened ramuli. *Substance* flaccid, adhering to paper. *Colour* a fine rose red, soon fading in fresh water. Sometimes the ramuli are alternate, and then the plant becomes *C. repens* of authors.

This pretty little species of *Callithamnion* was named by Dr. Roth after its discoverer Mr. Dawson Turner, the celebrated author of the Historia Fucorum and numerous other learned works. It was first observed on the Norfolk coast; and has since been found on most of the shores of Europe, where it not uncommonly creeps over the fronds of various small Algæ.

After as careful study as I have been able to give the subject, I am persuaded that *Cal. repens* of authors is nothing more than an imperfectly developed state of this species, in which either the plant is in a very young state, or, if more fully grown, the branches are mostly alternate. I have examined numerous specimens in which the alternate and opposite branching occurs in different parts of the same specimens; and as this is the chief character insisted on by those who contend for two species, its failure must destroy one of them. The form which has been called *C. Turneri* exhibits the species in its most perfect state, and therefore this name, apart from its commemorative significancy, deserves to be retained.

The fructification of this species differs in some respects from that of other *Callithamnia*, and shows an approach to *Griffithsia*, especially in the involucrated favellæ. The tetraspores are, however, not so regularly disposed as in that genus; and the habit is much more like that of *Callithamnion.*

Fig. 1. CALLITHAMNION TURNERI:—*of the natural size.* 2. Branch with *tetraspores.* 3. Portion of the same. 4. A tetraspore. 5. Portion of a filament with favellæ. 6. Ramulus and pedunculate favella.



W. H. H. del et lith.

Reeve, Benham & Reeve, imp.

PLATE CLXXX.

CLADOPHORA RUPESTRIS, *Kg.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit,* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος,* a *branch,* and *φορεω,* to *bear.*

CLADOPHORA *rupestris;* filaments capillary, rigid, dark green, straight, tufted, bushy; branches erect, crowded, densely clothed with appressed, opposite, or tufted, subulate ramuli; articulations three or four times longer than broad.

CLADOPHORA rupestris, *Kütz. Phyc. Gen.* p. 270.

CONFERVA rupestris, *Linn. Sp. Pl.* p. 1637. *Huds. Fl. Ang.* p. 601. *Lightf. Fl. Scot.* p. 994. *With. Br. Pl.* vol. iv. p. 140. *Fl. Dan.* t. 948. *Roth, Cat. Bot.* vol. ii. p. 238. *Dillw. Conf.* t. 23. *E. Bot.* t. 1699. *Ag. Syn.* p. 91. *Lyngb. Hyd. Dan.* p. 156. t. 54. *Ag. Syst.* p. 117. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Wyatt, Alg. Danm.* no. 95. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 136.

CONFERVA glauca, *Roth, Cat. Bot.* vol. ii. p. 208. t. 6.

CONFERVA virgata, *Roth, Cat. Bot.* vol. i. p. 195.

Var. *β. distorta;* tufts rooting in the mud, depressed; filaments short, much curled, and matted together; ramuli squarrose.

HAB. On rocks in the sea, between tide-marks; also beyond the limits of low water. Annual. Summer and autumn. Abundant on all the British shores. *β.* On submarine peat, at Birturbui Bay, Connemara, *Mr. Mc Calla.*

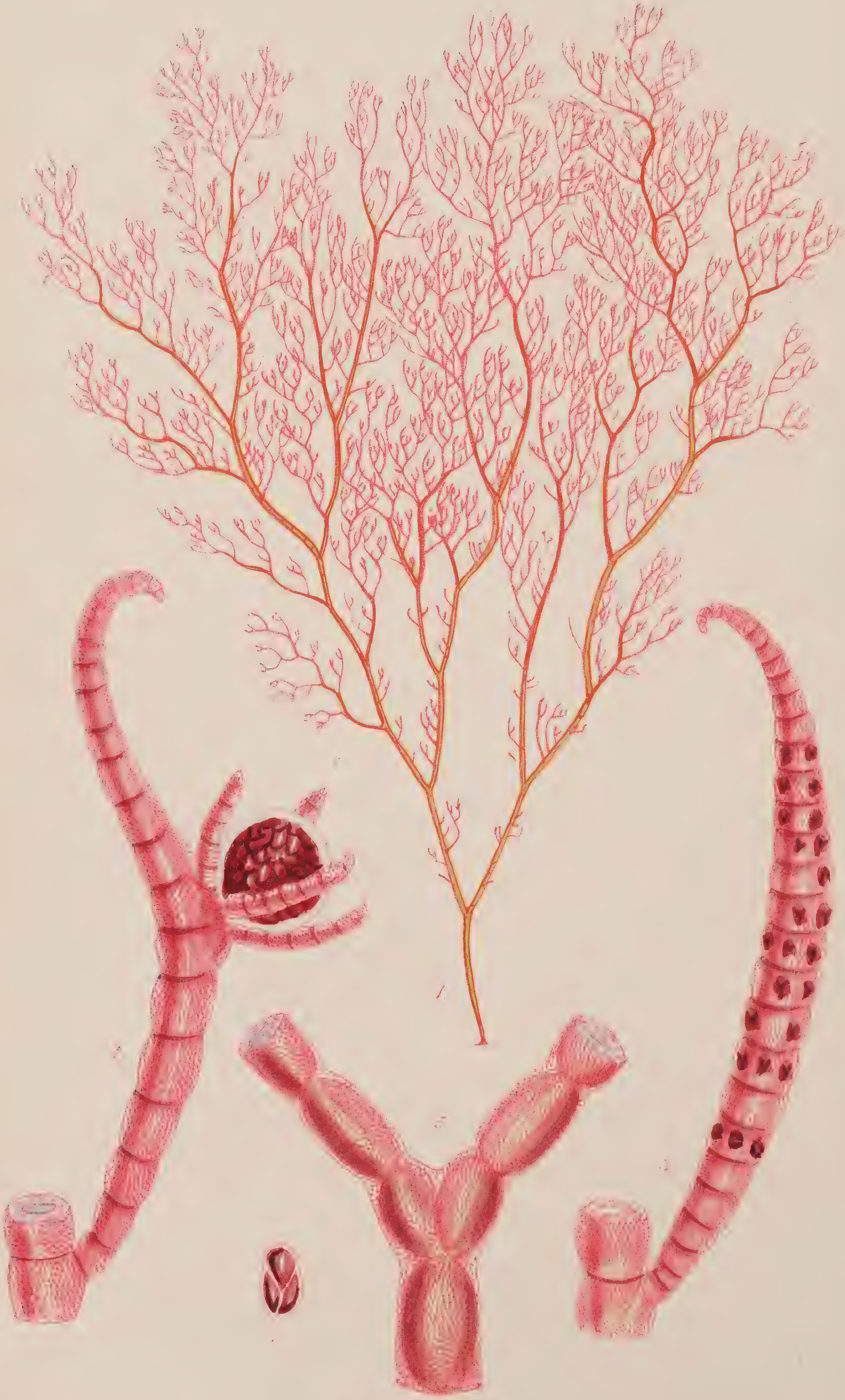
GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea.

DESCR. *Root* (except in var. *β.*) scutate. *Filaments* densely tufted, from four to six or eight inches in length, thicker than human hair, very much branched. *Branches* virgate, long, straight, repeatedly divided, set with opposite or quaternate, very erect, lesser branches, which are more or less furnished with ramuli. *Ramuli* closely appressed, subulate, tapering to a fine point, opposite, or occasionally alternate, or three or four rising from the same articulation, the pairs more or less approximating together. *Articulations* from three to five times longer than broad, slightly contracted at the dissepiments, filled with a dense endochrome. *Substance* rigid, not adhering to paper in drying. *Colour* a beautiful dark green, sometimes, especially when growing in deep water, reflecting glaucous tints.

A very beautiful plant, when well grown, common on all our rocky shores, and extending through the whole of the littoral zone, even into the belt of the *Laminariæ.* Specimens gradually increase in luxuriance, and in the purity and depth of their colour, as their habitat is remote from high water; and those which are collected in deep rock-basins, at the verge of the tide, are remarkably handsome. So common a plant could not escape notice from the earliest time, and consequently we find it mentioned both in Theophrastus and Dioscorides. A characteristic figure, for the age, is given by Dillenius; and it received its present name in the Species Plantarum of Linnæus.

Though it varies in some degree in the number of its ramuli, which on some specimens are closely crowded together, distant and few on others; yet there is always such a similarity in habit between all states of the plant, and such an identity of colour (and that a remarkably *dark* colour for the genus), that few persons who have once seen this species will mistake it for anything else. The only puzzling variety which I have met with is what I have called var. *β. distorta,* and this is only puzzling if seen for the first time in the study. In the field it still retains so much of the appearance of stunted forms of the species, that its difference of general habit does not deceive a practised eye; and its *habitat* is quite sufficient to account for the distorted forms it assumes. It is found, in the locality indicated, forming scab-like patches on the naked surface of the peat, just within the limit of the tide, in company with *Codium amphibium* and *Catenella opuntia.* A habitat more unlike that usually occupied by *C. rupestris* can scarcely be imagined. The species is therefore struggling hard against circumstances, on the confines of its capability of growing.

Fig. 1. Cladophora rupestris—tuft:—*of the natural size.* 2. Portion of a branch:—*magnified.* 3. Some of the ramuli:—*more highly magnified.*



W. H. H. del et lith.

Reeve, Benham & Reeve, imp

PLATE CLXXXI.

CERAMIUM RUBRUM, *Ag*.

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from κεραμος, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *rubrum*; filaments robust, gradually attenuated upwards, irregularly dichotomous, with lateral, forked or multifid ramuli, the apices hooked inwards; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, mostly borne on the lateral branchlets, subtended by three or four involucral ramuli.

CERAMIUM rubrum, *Ag. Syn.* p. 60. *Lyngb. Hyd. Dan.* p. 118. tab. 62. B. 1. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 135. *Grev. Fl. Edin.* p. 310. *Ag. Sp. Alg.* vol. ii. p. 146. *Harv. in Hook. Brit. Fl.* vol. ii. p. 336. *Wyatt, Alg. Danm.* no. 42. *Harv. in Mack. Fl. Hib.* part 3. p. 210. *J. Ag. Alg. Medit.* p. 81. *Endl. 3rd Suppl.* p. 36. *Kütz. Phyc. Gen.* p. 381.

CERAMIUM virgatum, *Roth, Cat. Bot.* vol. i. t. 8. f. 1. *Fl. Germ.* p. 461.

CERAMIUM elongatum, *Roth, Cat.* vol. ii. p. 178. *DC. Fl. Fr.* vol. ii. p. 44.

CERAMIUM axillare, *DC. Syn.* p. 9.

CERAMIUM nodulosum, *Ducluz. Ess.* p. 61 *DC. Syn.* p. 9.

CONFERVA rubra, *Huds. Fl. Ang.* p. 600. *With. Br. Pl.* vol. iv. p. 138. *E. Bot.* t. 1166. *Dillw. Conf.* t. 34. *Fl. Dan.* t. 1482.

CONFERVA nodulosa, *Lightf. Fl. Scot.* p. 994.

CONFERVA tubulosa, *Huds. Fl. Ang.* p. 600.

CONFERVA flosculosa, *Ellis. Phil. Tr.* 57. p. 425. t. 18.

Var. β. *secundatum*; lateral ramuli mostly secund.

CERAMIUM secundatum, *Lyngb. Hyd. Dan.* p. 119. t. 18.

HAB. Growing on rocks, stones, and the smaller Algæ in rock-pools from near the extreme of high water to low-water mark; also dredged in four or five fathoms. Annual. Summer and autumn. Very abundant on all parts of the British coasts.

GEOGR. DISTR. Abundant throughout the temperate zones of both hemispheres; also in the tropical ocean, both east and west.

DESCR. *Root* scutate. *Filaments* solitary or tufted, from one or two to twelve inches long, or more, as thick as hog's bristle, or twice as thick in the lower part, gradually attenuated upwards, irregularly dichotomous at longish intervals, and furnished more or less copiously with lateral simple, forked, or repeatedly dichotomous ramuli: the axils patent; the apices either hooked inwards or straight. Minor characters of branches excessively variable. *Articulations* opake, coated with a thick stratum of small coloured cells, marked (frequently) with an oval area, being an internal air-cell or tube, seen through the coat; dissepiments contracted. *Favellæ* involucrate, spherical, borne on the sides of lateral short ramuli. *Tetraspores* immersed in the substance of the articulations, several in each articulation, in a transverse line. *Colour*, where the plant is in perfection, a fine, deep, clear-red; varying to all shades of red-brown, fulvous, yellow, and even greenish, down to white. *Substance* membranaceous or cartilaginous. It more or less perfectly adheres to paper.

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This plant, one of the most universally diffused of the *Florideæ*, and one of the commonest on every shore where it grows, puts on so many deceptive appearances that the young botanist and even the experienced observer are again and again deceived by it. As it grows from near the limit of high water to beyond the recess of the tide, it is exposed to a very variable amount of solar light and heat, a circumstance which at once accounts for the varieties in colour which the frond assumes. The variations in ramification depend on more hidden causes: but they are such that, however dissimilar different specimens may seem, other intermediate states may in most instances be detected which perfectly connect them. Still it is *possible* that the specific characters above given may apply to more than one species. I now allude to a virgate plant which I have hitherto regarded as a variety of *C. rubrum*, but which may ultimately, perhaps, be admitted to rank as a species, should a more definite character be discovered to distinguish it. The *Ceramia* are almost as unsatisfactory to the botanist as the *Rubi*; and their varieties quite as numerous. They are, however, very beautiful plants, and thus, in some degree, the botanist is repaid for the trouble which their investigation often occasions.

Fig. 1. CERAMIUM RUBRUM:—*of the natural size*. 2. Ramulus with a favella. 3. Ramulus with imbedded tetraspores. 4. Tetraspores. 5. Portion of the main filaments:—*all magnified*.
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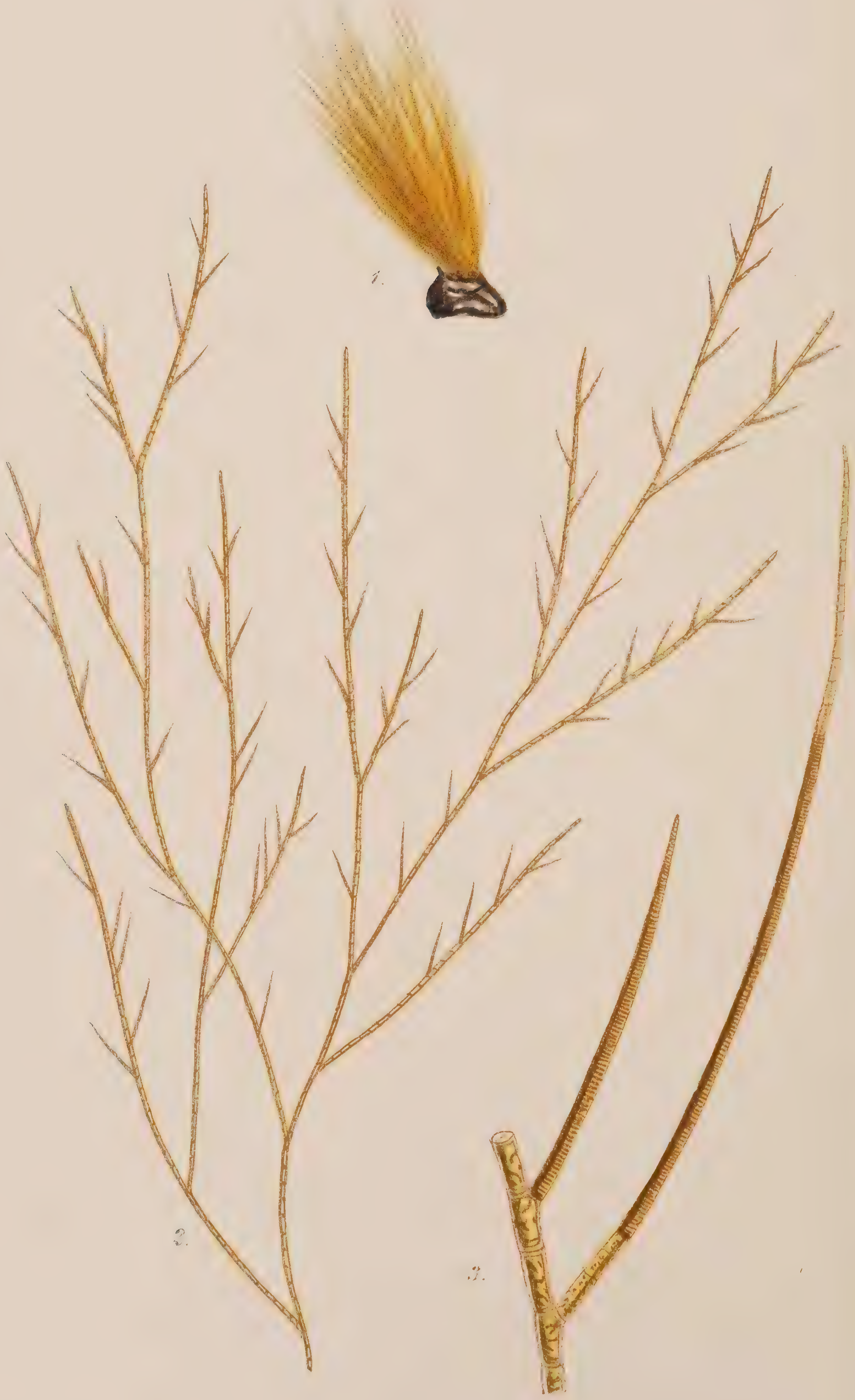
is much more strongly developed than in others, the branches in them being singularly rope-like; while in an opposite variety the tips of the filaments and their lateral divisions are so nearly free that the plant assumes quite a feathery aspect.

On different parts of the coast this species differs much in size. It appears to flourish best in the north, especially in muddy, land-locked bays. Some specimens gathered by Dr. Greville in Staffa and Iona, and figured in that author's admirable Crypt. Flora, are exceedingly luxuriant; and I possess others from Carrickfergus of nearly equal beauty. The colour, too, is subject to much variation, but this is probably dependent on age, becoming more and more rusty as the season advances.

E. tomentosus was among the earliest of the genus noticed by botanists. It is described in the Historia Muscorum of Dillenius, and rudely figured at Tab. 3. f. 13. of that great work. Such at least is the opinion of Dillwyn: but Agardh refers the description and figure to his *E. compactus*, a plant which, to judge by the specimens which I have seen, is only an old and matted state of *E. littoralis*.

Fig. ECTOCARPUS TOMENTOSUS:—*of the natural size.* 2. A small part of the fibrous frond:—*magnified.* 3. Portion of a filament: *highly magnified.*



Reeve, Benham & Reeve, imp.

PLATE CLXXXIII.

ECTOCARPUS AMPHIBIUS, *Harv.*

GEN. CHAR. *Frond* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit* either spherical, elliptical, or lanceolate *utricles* (or *spores*) borne on the ramuli, or imbedded in their substance. ECTOCARPUS (*Lyngb.*),—from *εκτος*, *external*, and *καρπος*, *fruit.*

ECTOCARPUS *amphibius*; tufts short, loose, soft, pale olive; filaments very slender, subdichotomous; ultimate branches alternate, spreading; articulations two or three times longer than broad; utricles (?) linear-attenuate, spine-like, mostly sessile, scattered.

ECTOCARPUS amphibius, *Harv. Phyc.* vol. i. p. x.

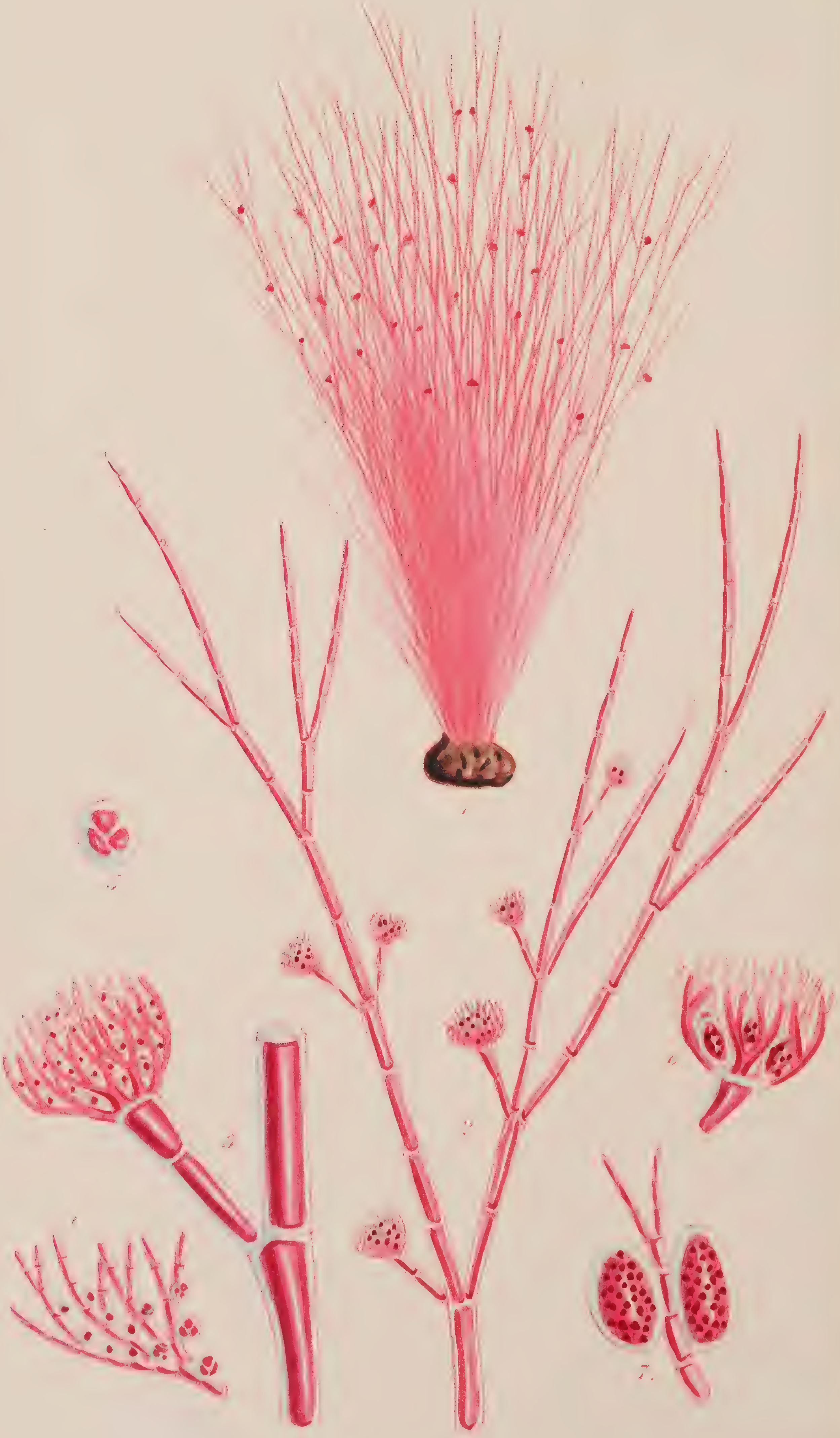
HAB. In muddy ditches of brackish water, near the coast. Tide ditches, communicating with the Avon, below Bristol. *Mr. G. H. K. Thwaites.*

GEOGR. DISTR.

DESCR. *Filaments* 2–3 inches long, very slender, flaccid, forming small, indefinite tufts, growing on the mud, or attached to various substances, vaguely branched in a manner between dichotomous and alternate; the lesser divisions mostly alternate, erecto-patent, not much divided, nor remarkably attenuate. *Ramuli* scattered, thorn-like, at length frequently changed into exceedingly long, sessile, opake, sporaceous bodies, evidently analogous to the utricle of *Ectocarpus siliculosus*, and of a character intermediate between these and the immersed fructification of *E. littoralis.* *Articulations* of the main branches twice or thrice as long as broad, pale olive, pellucid, mostly marked with a few irregular bands of more solid endochrome. *Colour* fading in the Herbarium, and becoming greener. In drying, it closely adheres to paper.

The occurrence of an *Ectocarpus* in brackish water, though not without precedent, deserves to be recorded, and it is more on that account, than because I am certain of the present plant being a good species, that I give it a place in this work. It will be seen that its characters border very closely on those of *E. siliculosus*, from which the usually sessile fructification and the attenuated form of this part chiefly distinguish it. The resemblance is so striking that one is almost disposed to the belief that our *E. amphibius* may be only *E. siliculosus* altered by growing in water which contains a very small quantity of salt. Mr. Thwaites, to whom I am indebted for a beautifully mounted specimen, and who also had the kindness to communicate fresh specimens, gathered it in ditches near Bristol, into which the tide flows. It will probably be found to occur in similar situations elsewhere.

Fig. 1. ECTOCARPUS AMPHIBIUS; a tuft:—*of the natural size.* 2. A branch:—*magnified.* 3. Fertile ramuli:—*highly magnified.*



W. H. H. del et lith

Reeve Benham & Reeve imp

PLATE CLXXXIV.

GRIFFITHSIA SETACEA, *Ag.*

GEN. CHAR. *Frond* rosy-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucral ramuli; 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths,* the most distinguished of British Algologists.

GRIFFITHSIA *setacea*; filaments setaceous, straight, rigid, dichotomous, or subdichotomous; axils very acute; lesser branches sometimes opposite, attenuated to a point, erect; articulations cylindrical, five or six times longer than broad; involucres (of both kinds) pedunculate, lateral.

GRIFFITHSIA setacea, *Ag. Syn.* p. xxviii. *Ag. Syst.* p. 144. *Ag. Sp. Alg.* vol ii. p. 129. *Grev. Fl. Edin.* p. 312. *Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* part 3. p. 212. *Wyatt, Alg. Danm.* no. 137. *Harv. Man.* p. 103. *Endl. 3rd Suppl.* p. 35. *Kütz. Phyc. Gen.* p. 373. *Hook. fil. Fl. Ant.* vol. i. p. 191.

CONFERVA setacea, *Ellis, Phil. Trans.* vol. 57. t. 18. f. *e*. *Turn. Linn. Tr.* vol. vii. p. 107. *Huds. Fl. Ang.* p. 599. *With.* vol. iv. p. 137. *E. Bot.* t. 1689. *Dillw. Conf.* t. 82. *Roth, Cat. Bot.* vol. iii. p. 278.

HAB. On the perpendicular sides of deep rock pools, near low-water mark, under the shade of larger Algæ. Perennial. Fruiting in spring and summer. Frequent on the British shores, from Orkney to Cornwall. Channel Islands.

GEOGR. DISTR. Atlantic shores of Europe and America. Southern Ocean, especially Tasmania.

DESCR. *Tufts* three to eight inches long, or more, dense, frequently interwoven in the lower part with tangled fibres. *Filaments* as thick as hog's bristle, sometimes not quite so thick, gradually attenuated from the base upwards, many times dichotomous at short intervals; the lesser divisions more irregular, alternate, or secund, frequently opposite; all the branches straight, and generally erect, with acute axils. Frequently small, root-like, irregular, horizontal ramuli issue from the sides of the main branches, and catching on a neighbouring branch, connect the filaments in a tangled web. Lesser branches gradually attenuated to the point. *Articulations* cylindrical; the lower ones five or six times as long as broad, or sometimes more; the upper gradually shorter, all containing bags of endochrome surrounded by a narrow border. *Involucres* of both kinds raised on short, lateral peduncles, about a line in length, scattered on the sides of the branches, those containing tetraspores most frequently found. *Tetraspores* spherical, attached to the inner faces of the dichotomous, involucral ramuli, with wide borders. *Favellæ* generally binate, oval, likewise attached to involucral ramuli, on distinct plants. *Antheridia*, or minute oval bodies, composed of dense whorls of exceedingly minute, glassy filaments, frequently occupy the place of tetraspores in the involucres. *Colour*, a fine transparent crimson, instantly discharged, with a crackling noise, in fresh water. *Substance* rather rigid and crisp, becoming flaccid after exposure to the air. In drying the plant adheres, but not very closely, to paper.

A long known and beautiful plant, found on all the British shores, and widely dispersed through the ocean; being found not only in the Atlantic, but in several parts of the Southern Pacific Ocean. From Van Dieman's Land I have seen very numerous specimens undistinguishable from British-grown ones.

When quite fresh, it is remarkably crisp and firm in substance, the points of its filaments standing firmly out, when the tuft is removed from the water. But it very rapidly becomes flaccid, and if dropped into fresh water, the membranous walls of its filaments burst asunder with violence, and with a sharp crackling noise, discharging the contents of the cells into the water. These form a fine powder of a brilliant carmine colour, and might, no doubt, be used as a pigment if the plant could be collected in sufficient quantity. Paper stained with this powder retains its brilliancy of colour in the Herbarium for many years. These remarks apply equally to other species of the genus.

I may add that, delicate as the structure of this plant assuredly is, no marine Alga is more patient of confinement, or may be more easily *domesticated.* A tuft placed in a closed bottle of sea water in April 1846, is now, after more than two years' imprisonment, apparently as fresh and healthy as when first taken from the sea. The water has not been changed, and is perfectly clear and pure. The plant has not grown much, as the bottle is a small one, but its threads reach nearly to the surface of the water; and no decay has taken place.

Fig. 1. GRIFFITHSIA SETACEA; tuft:—*of the natural size.* 2. Upper part of a fertile branch. 3. Involucre with *tetraspores.* 4. Ramulus from the same. 5. A tetraspore. 6. Involucre with *favellæ.* 7. Ramulus from the same:—*all more or less highly magnified.*

Plate CLXXV

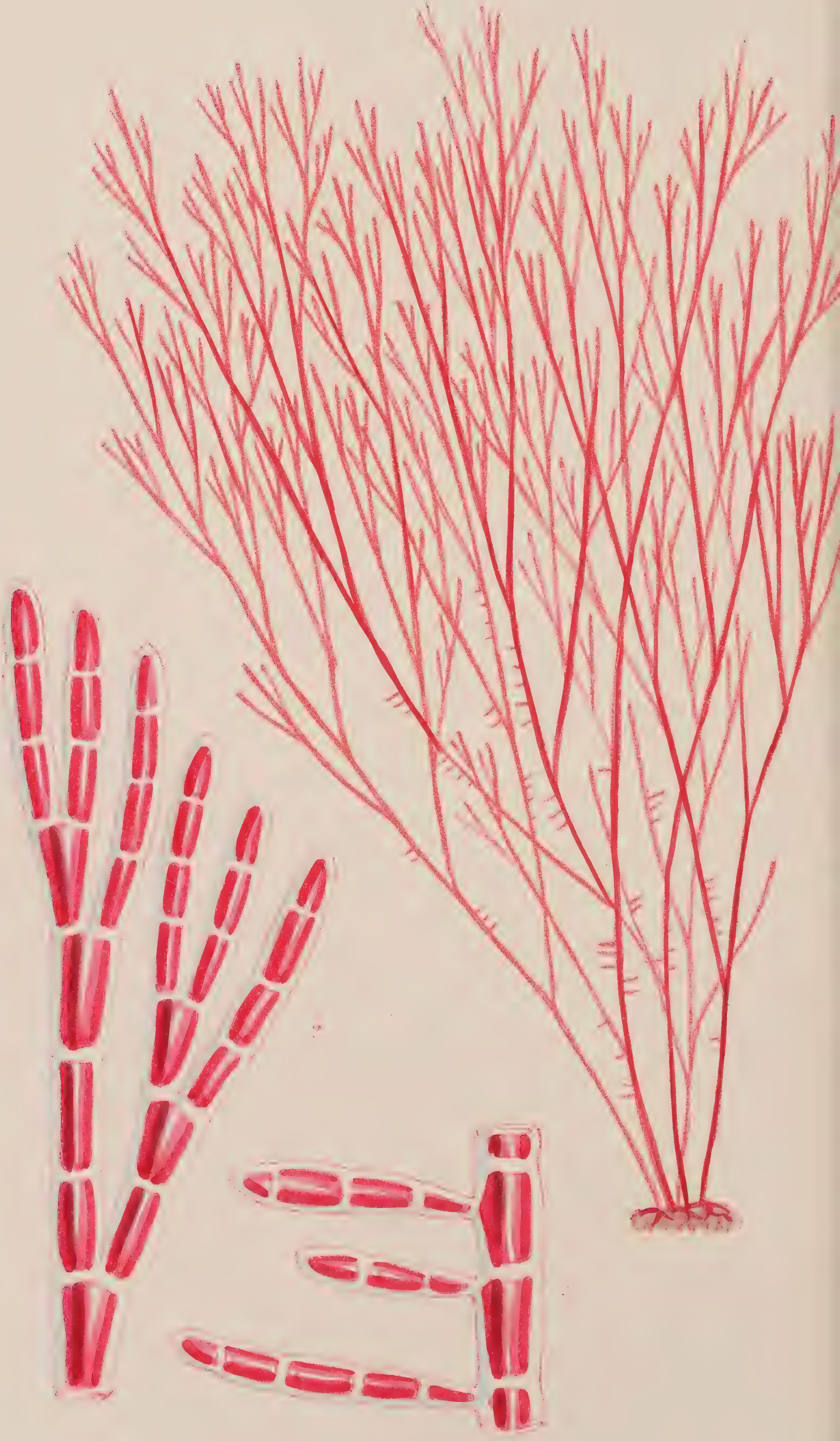


PLATE CLXXXV.

GRIFFITHSIA SECUNDIFLORA, *J. Ag.*

GEN. CHAR. *Frond* rosy-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucral ramuli. 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths,* the most distinguished of British Algologists.

GRIFFITHSIA *secundiflora*; filaments ultra-setaceous, somewhat gelatinous but firm, irregularly dichotomous, the lesser divisions flabellate; axils acute; branchlets fastigiate, obtuse, not tapering to a point; articulations cylindrical, two to four times as long as broad, with a very wide border; "involucres on very short, lateral peduncles."

GRIFFITHSIA secundiflora, *J. Ag. in Linn.* vol. xv. p. 39. *Alg. Medit.* p. 75. *Mont. Algier.* p. 141. *Endl. 3rd Supp.* p. 35.

GRIFFITHSIA crassa, *Kütz. Phyc. Gen.* p. 374.

GRIFFITHSIA intermedia, *Lenorm. in Herb.*

GRIFFITHSIA corallina β. *Bonn. Hyd. loc.* p. 96.

CERAMIUM corallinum, var. majus, *Desmaz. Crypt. Fr.* no. 1032.

CERAMIUM Desmazieri, *Crouan, MS.*

HAB. On rocks, at extreme low-water mark. Perennial? Discovered at Bovisand, near Plymouth, August, 1846, by the *Rev. W. S. Hore.*

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea.

DESCR. *Filaments* originating in branched, decumbent, matted fibres; tufted, four to eight inches high, thicker than hog's bristle, not sensibly attenuated upwards, generally simple below for the space of one or two inches, afterwards repeatedly and more or less closely dichotomous, with somewhat of a fan-shaped outline; the lesser divisions not regularly forked but often alternately or secundly divided: all the divisions very erect, and the axils, especially the upper ones, narrow and acute. Lesser branches and ramuli not tapering upwards, and very blunt. *Articulations* with a very wide pellucid border and narrow endochrome, cylindrical or sometimes obscurely pyriform, the lowermost about four times, the upper about twice as long as broad. *Fructification* not as yet seen on British specimens. *Colour* a fine, full crimson, quickly discharged, with rupture of the membrane and curving of the branches, in fresh water. *Substance* between gelatinous and membranaceous, firm, closely adhering to paper in drying. Short, horizontal, secund, root-like ramuli, often issue from the lower part of the branches.

This noble species, one of the finest of the section to which it belongs, was added to the British Flora, in the year 1846, by the Rev.

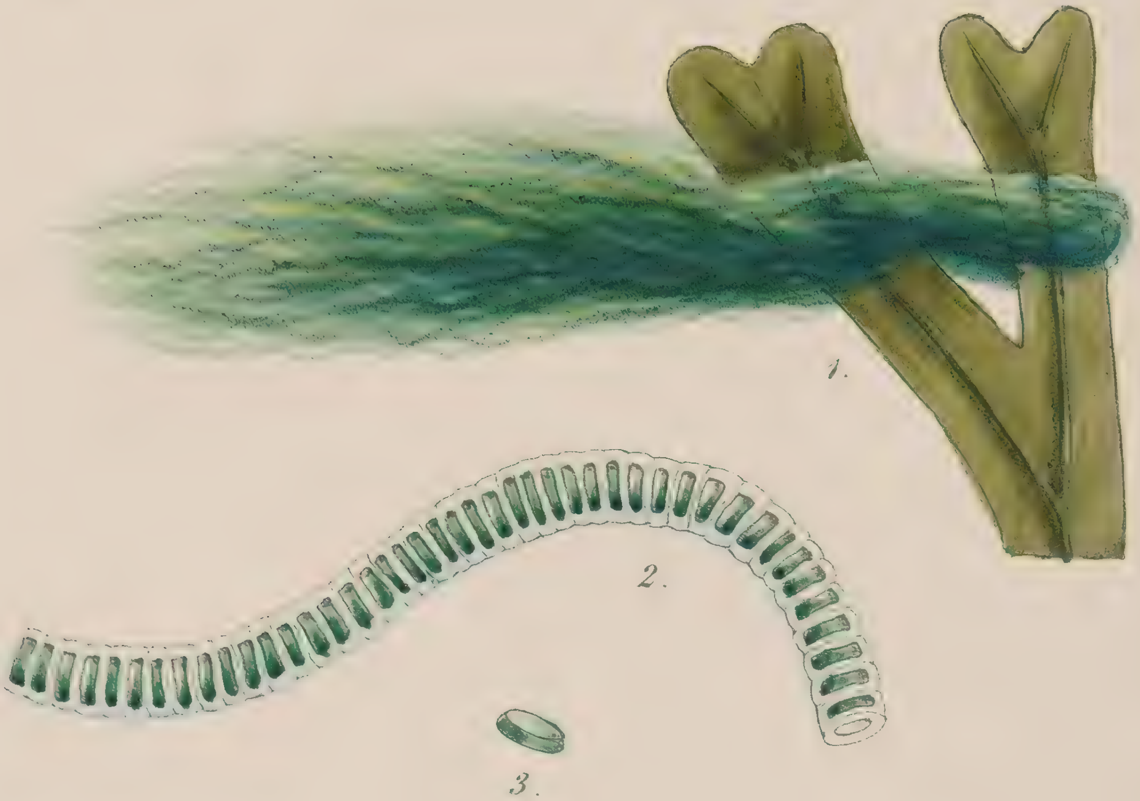
W. S. Hore, who had the good fortune about the same time to discover a new species (*G. Devoniensis*) of this charming genus, which is already figured in our first volume. I delayed the publication of the present novelty in the hope that its fructification might be detected on British specimens; but this hope having hitherto been disappointed, I do not wish further to delay introducing so interesting a plant to British botanists, although my figure wants a representation of the fruit. I could certainly have figured *fruit* from an exotic specimen, had I thought it expedient to do so. The *favellæ* resemble those of *G. setacea,* but are raised on much shorter peduncles

From *G. setacea* this plant may, at once, be known by its larger size, its comparatively shorter joints, and more lubricous substance; but especially by the very obtuse, cylindrical, upper ramuli, which do not taper to a point, but are of equal diameter throughout. From *G. corallina,* which in many respects it resembles, its cylindrical articulations and different inflorescence distinguish it.

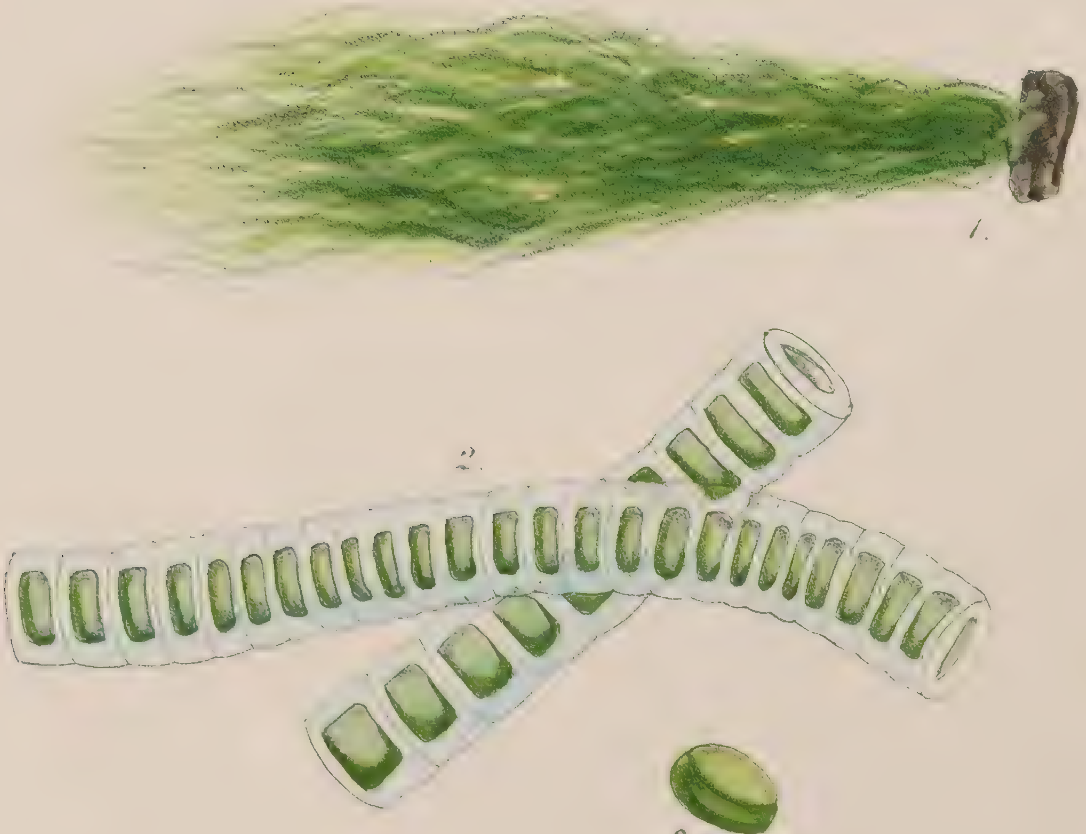
G. secundiflora, though first noticed as a variety by Bonnemaison, was not well understood until the younger Agardh pointed out its characters, and clearly distinguished it from *G. setacea* and *G. corallina,* to one or other of which it had formerly been referred. It is one of the most common of the genus in the Mediterranean, from several parts of which sea I have received specimens. It occurs less commonly on the coasts of France and Spain, and reaches its northern limit on the coast of England, in the same locality that produces the equally southern *Stenogramme* and *Carpomitra.* Dr. Hooker brought from the Falkland Islands specimens which we at first referred to this species; but which, as they offer some points of difference, we now regard, provisionally, as a distinct species (*G. antarctica*).

Fig. 1. Griffithsia secundiflora:—*of the natural size.* 2. Apex of a filament. 3. Part of the same, with root-like ramuli:—*magnified.*

A.



B.



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Reeve, Benham & Reeve imp.

PLATE CLXXXVI. *A.*

LYNGBYA CARMICHAELII, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongate, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular *sporidia.* LYNGBYA (*Ag.*),—in honour of *Hans Christian Lyngbye,* author of an excellent work on the Algæ of Denmark.

LYNGBYA *Carmichaelii*; filaments very long, thickish, curled, and tortuous, cylindrical, forming extensive, grass-green, closely entangled strata; tube imperfectly jointed.

LYNGBYA Carmichaelii, *Harv. in Hook. Br. Fl.* vol. ii. p. 371. *Harv. Man.* p. 161. *Wyatt, Alg. Danm.* no. 230.

LYNGBYA crispa, *Carm. Alg. App. MS.* (*not of Ag.*)

HAB. On marine rocks, between tide marks; also on *Fuci, Zostera,* floating timber, &c. Annual. Summer. Appin, *Capt. Carmichael.* Plymouth and Torbay, *Mrs. Wyatt.* Cornwall, Swansea, Anglesea, &c., *Mr. Ralfs.* Jersey, *Miss White.* Several places on the Irish coast.

GEOGR. DISTR.

DESCR. Forming very widely spreading, closely interwoven strata, often many yards in diameter, spreading continuously over rocks, and investing any plant, or other object, which may obstruct its progress, covering them with a shaggy coat of an intense grass green. *Filaments* several inches long, floating freely in water, flaccid, at first straight, or but slightly curved, afterwards becoming very much curled and interwoven together. The colouring matter in an early stage nearly fills the tube, being divided into short portions, by closely approaching transverse striæ. As the season advances the endochrome gradually contracts, separating into distinct lenticular sporidia, a more or less perfect septum being visible between each. Finally, the sporidia burst through the tube, leaving it perfectly colourless. When dry, the filaments become a dull, dark green, without gloss: in this state they more or less adhere to paper.

One of the many discoveries of the late Capt. Carmichael of Appin, whose name it bears. The two species represented in this plate, while they are evidently closely allied to each other, differ in some degree from the true *Lyngbyæ,* approaching nearer to Agardh's genus *Sphæroplea.* There is a more distinct cellular division in the tube than is typical of the genus with which they are associated, and, perhaps, at a future time they may be removed. But the whole group requires revision, and deserves more attention than it has yet obtained. The present species I believe to be common to many parts of the British coast; but is, perhaps, often confounded with *Conferva tortuosa*, which it much resembles in habit and general aspect.

A. Fig. 1. LYNGBYA CARMICHAELII, growing on *Fucus vesiculosus*:—*of the natural size.* 2. Portion of a ripe filament. 3. A sporidium:—*both magnified.*

PLATE CLXXXVI. *B.*

LYNGBYA SPECIOSA, *Carm.*

LYNGBYA *speciosa*; filaments long, thick, flaccid, straight, at length curled, the margin crenate, forming bright yellow-green strata, glossy when dry; tube imperfectly jointed.

LYNGBYA speciosa, *Carm. Alg. Appin. ined.* *Harv. in Hook. Br. Fl.* vol. ii. p. 371. *Harv. Man.* p. 161. *Wyatt, Alg. Danm.* no. 196.

HAB. On marine rocks, between tide-marks, and on *Fuci*. Annual. Summer. Appin, *Capt. Carmichael.* Paington, Torbay, *Mrs. Griffiths.* St. Michael's Mount, *Mr. Ralfs.*

GEOGR. DISTR.

DESCR. This species, like *L. Carmichaelii*, forms widely spreading strata of a vivid green colour, covering the surface of rocks and *Fuci* with a fleecy coat, till lifted by the returning tide. The diameter of the filament is nearly twice as great as in *L. Carmichaelii*, the colour is greatly brighter, and the substance more gelatinous and glossy. In other respects the plants closely resemble each other. Filaments at first straight, three or four inches long, flaccid, at length becoming curled and crenate. *Endochrome* at first nearly filling the tube, gradually contracting as it solidifies, and at length formed into a lenticular sporidium, which, when ripe, bursts through the walls of the tube, leaving the filaments perfectly colourless. A more or less evident division into cells is observable.

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This very pretty species is nearly related to the preceding, from which it is chiefly distinguished by the larger size, brighter colour, and more lubricous substance. It adheres far more closely to paper in drying, and does not so perfectly recover its form after having once been dried.

B. Fig. 1. Tuft of LYNGBYA SPECIOSA, on a rock:—*of the natural size.* 2. Portion of mature filaments. 3. A sporidium:—*all highly magnified.*
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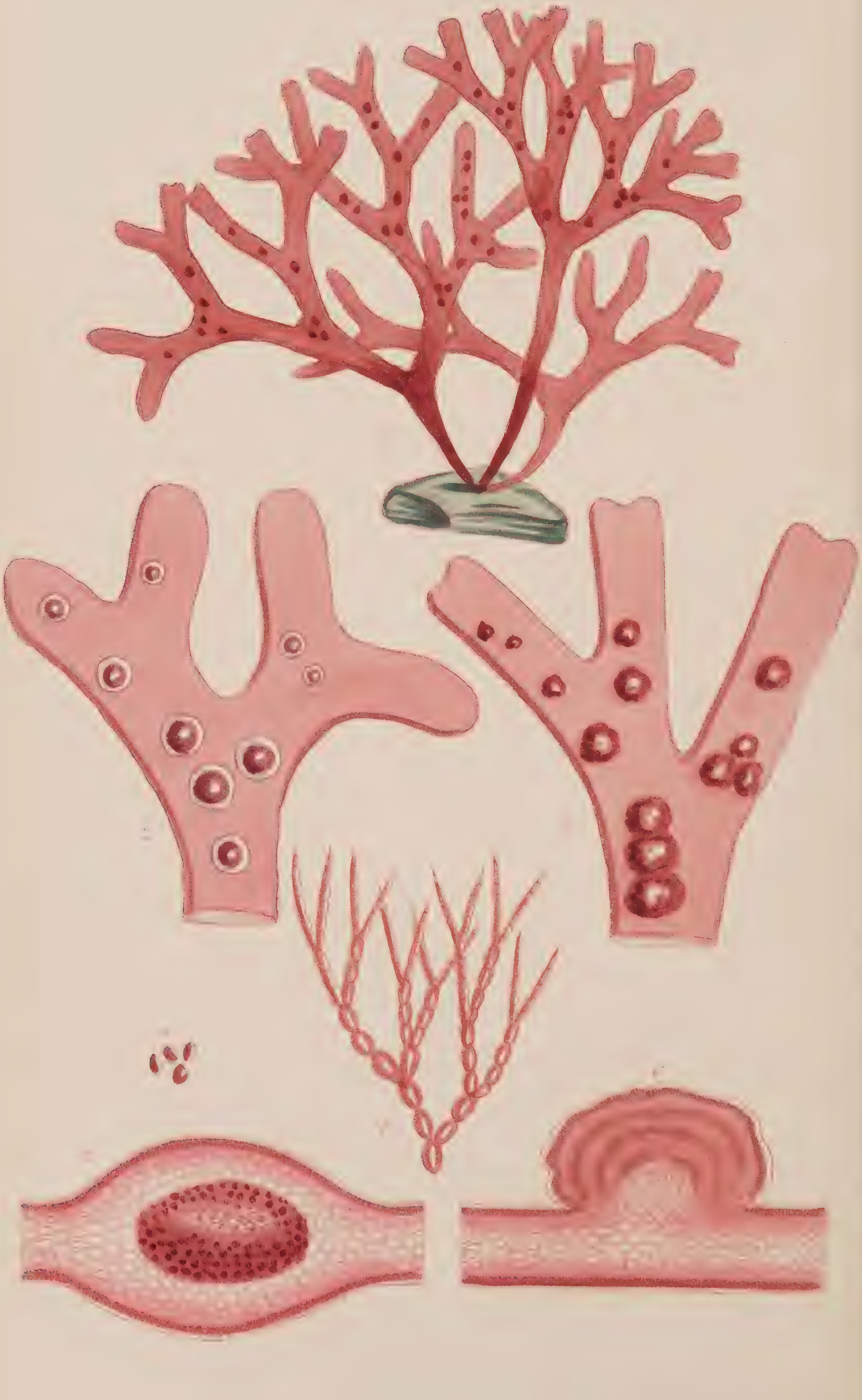
Plate CLXXXVII.



W. H. H. del. et lith.

Reeve Benham & Reeve imp.

PLATE CLXXXVII.

CHONDRUS NORVEGICUS, *Lamour.*

GEN. CHAR. *Frond* cartilaginous, nerveless, compressed or flat, flabelliform, dichotomously cleft; formed internally of three strata; the *inner,* of densely packed, longitudinal fibres; the *medial* of small roundish cells; the *outer,* of vertical, coloured, moniliform filaments. *Fructification;* 1, prominent *tubercles* (*nemathecia*) composed of radiating filaments, whose lower articulations are at length dissolved into *spores* (?); 2, *tetraspores* collected into sori, immersed in the surface of the frond; 3, *favellidia,* scattered through the surface, composed of minute *spores.* CHONDRUS (*Stack.*),—from χονδρος, *cartilage.*

CHONDRUS *Norvegicus;* frond linear, dichotomous, flat; the axils patent; the apices rounded; favellidia minute, imbedded in the substance, or prominent, sessile warts (*nemathecia*) scattered over both surfaces of the frond.

CHONDRUS Norvegicus, *Lamour. Ess.* p. 39. *Lyngb. Hyd. Dan.* p. 16. *Grev. Alg. Brit.* p. 130. *Harv. Man.* p. 77. *Harv. in Mack. Fl. Hib.* part 3. p. 202. *Wyatt, Alg. Danm.* no. 120. *J. Ag. Alg. Medit.* p. 95. *Mont. Fl. Algier,* p. 117. *Endl. 3rd Suppl.* p. 39.

SPHÆROCOCCUS Norvegicus, *Ag. Sp. Alg.* vol. i. p. 255. *Ag. Syst.* p. 218. *Spreng. Syst. Veg.* vol. iv. p. 335.

ONCOTYLUS Norvegicus, *Kütz. Phyc. Gen.* p. 411.

FUCUS Norvegicus, *Gunn. Fl. Norv.* vol. ii. p. 122. t. 3. f. 4. *Turn. Syn.* p. 222. *Turn. Hist.* t. 41. *E. Bot.* t. 1080. *Stack. Ner. Brit.* t. 18.

FUCUS Devoniensis, *Grev. in Wern. Trans.* vol. iii. p. 396.

HAB. On rocks, near low-water mark. Annual? September to March. Rather rare. Dover and Swansea, *Dillwyn.* Exmouth, *Sir T. Frankland.* Devonshire (several places), *Mrs. Griffiths.* Sussex, *Mr. Borrer.* Falmouth Bay, *Miss Warren.* Mounts Bay, *Mr. Ralfs.* Plymouth, *Rev. W. S. Hore.* Bantry, *Miss Hutchins.* Youghal, *Miss Ball.* Miltown Malbay, &c., and Wicklow, *W. H. H.* Antrim, *Mr. Moore.* Saltcoats, *Rev. D. Landsborough.*

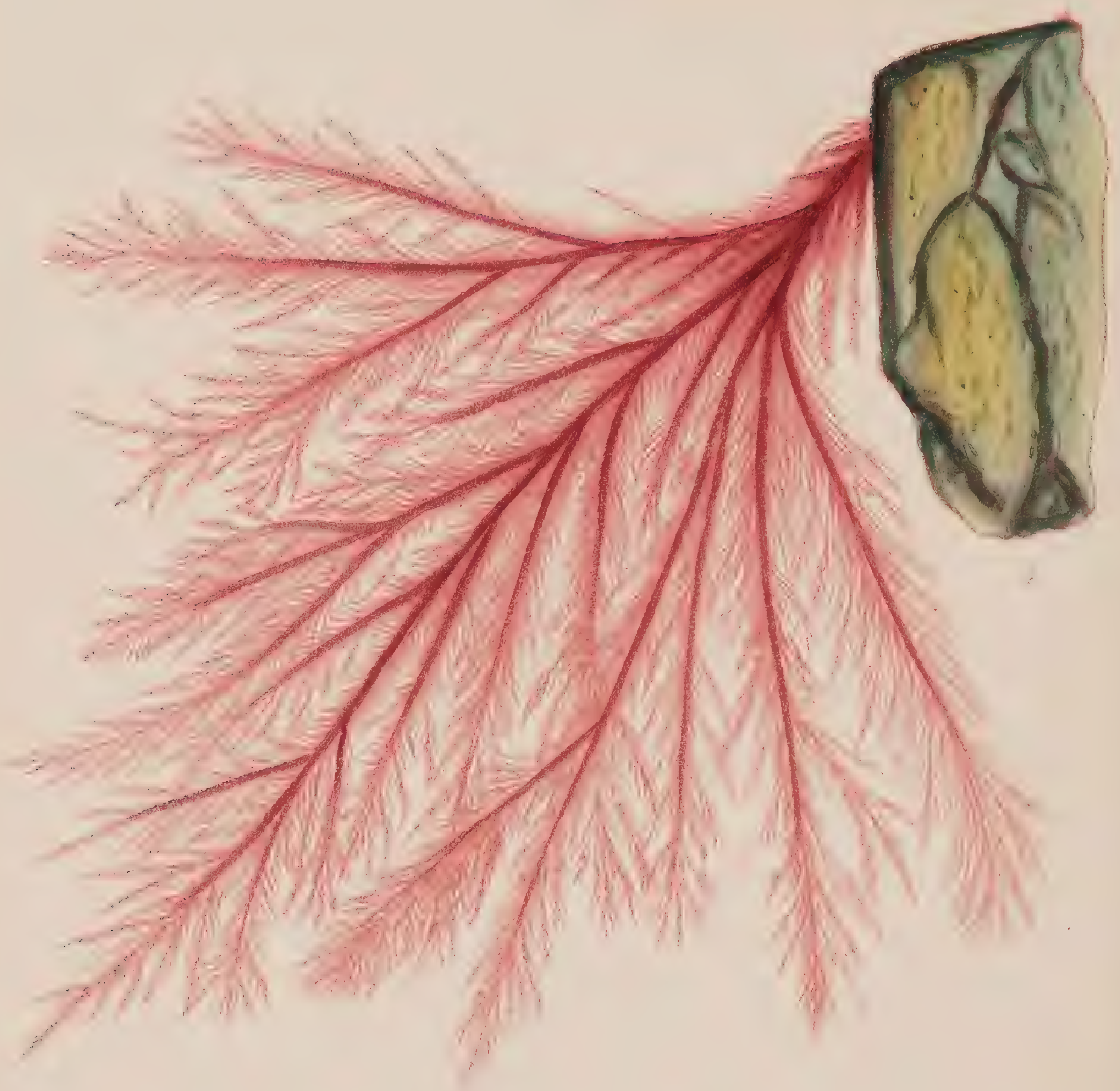
GEOGR. DISTR. Coast of Norway, *Gunner.* More frequent on the shores of France and Spain. Mediterranean Sea.

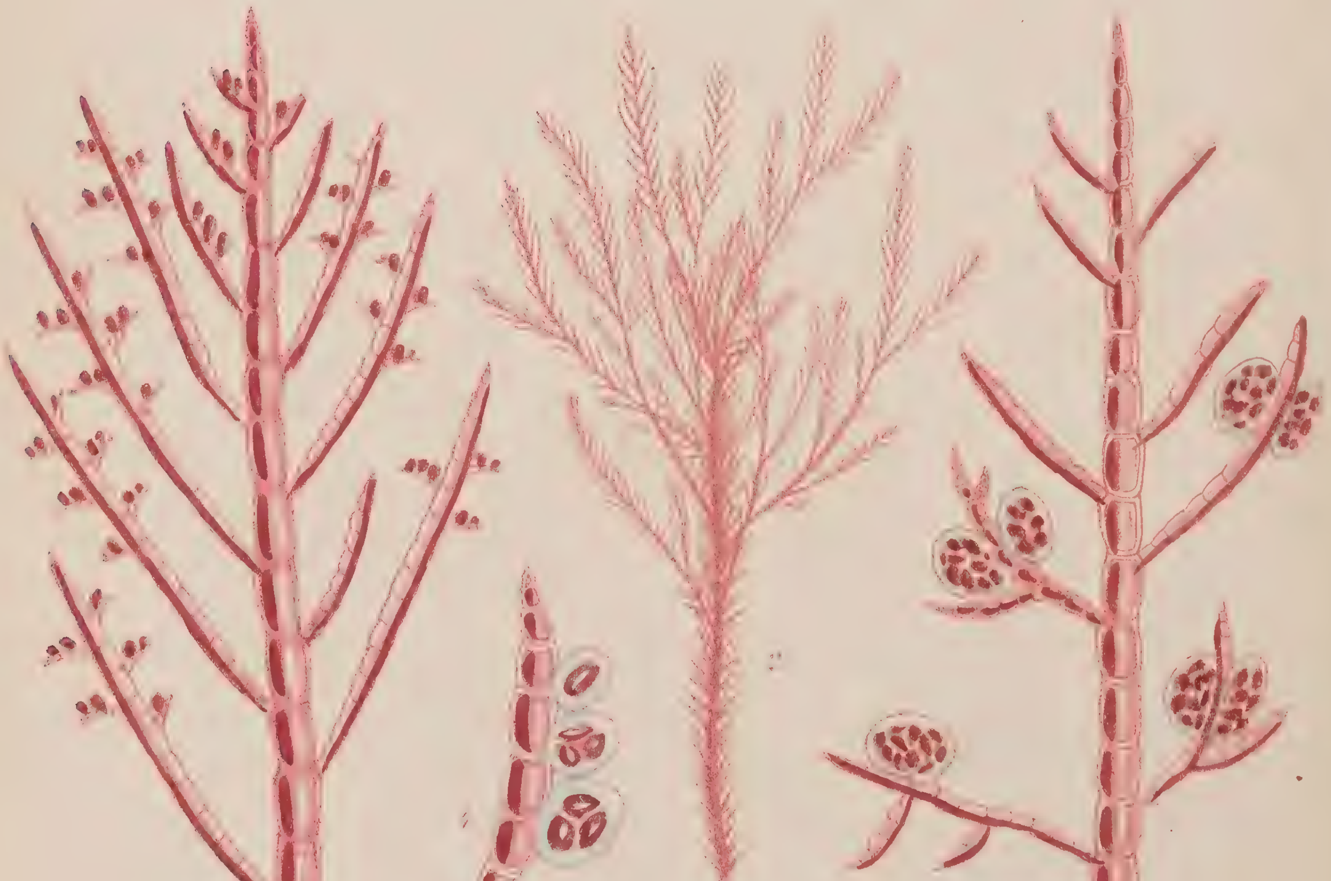
DESCR. *Root,* an expanded callus. *Fronds* two to three inches high, more or less tufted, rising with a short, cylindrical stem, as thick as small twine, which soon forks, and almost immediately flattens, gradually widening till it becomes from an eighth to a quarter of an inch in width, again forks and repeats this process more or less regularly three or four times; the segments continuing nearly of the same breadth throughout and ending in a very blunt, simple, or emarginate point, all the axils remarkably patent. Sometimes there is scarcely any stem, the frond branching nearly from the base; in other specimens the undivided stipe is sometimes nearly two inches in length. *Fructification*; minute, depressed, spherical *favellidia*, immersed in the substance of the frond, and scattered through its upper segments, each with a pale margin, and filled with very numerous spores. 2, roundish or irregularly shaped *warts* (*nemathecia*), sessile on the frond, and densely scattered over its surface, wholly composed of vertical, dichotomous, moniliform filaments. *Substance* cartilaginous and firm, rather thin. *Colour* a deep, but dull, blood-red, paler, and more pinky in the younger parts. In drying, it does not adhere to paper.

The first account of this species is given by Bishop Gunner in his Flora Norvegica, if, indeed, the synonym of that author be correctly referred by Turner to this place; a fact which has been more than once suspected, many believing that the plant represented by Gunner is only a variety of *C. crispus*. Mr. Dillwyn was the first to detect it on the British shores, as well as the first to notice the nemathecia-fructification, which is the only kind described by Turner, and is much more generally produced than the tubercles; indeed, it is very rare to find a plant destitute of nemathecia. The *tubercles* have, I believe, only been found by Mrs. Griffiths at Torquay, and by her but seldom. They are at once distinguished from the nemathecia by their more regular form, and the colourless limb which surrounds them; and by being evidently immersed in the substance of the frond.

Chondrus Norvegicus, if it be identical with the northern plant described by Gunner, is singularly unfortunate in its specific name, as it is much more common to the south of Norway than in that country. Even in England, it is very much more abundant on the south coast, and occurs still more frequently on the shores of France and Spain, and in the Mediterranean. Though with a general resemblance to *C. crispus*, there is something in the tone of its colour, the divaricated laciniæ, and the rounded axils and apices that render it easy to be recognised, independently of the difference in fructification. The species most nearly allied to it is *C. crenulatus*, a native of Portugal, which may probably yet be added to the British list.

Fig. 1. CHONDRUS NORVEGICUS:—*of the natural size.* 2. Portion of a frond with *favellidia.* 3. Section of a *favellidium.* 4. Spores from the same. 5. Portion of a frond with *nemathecia.* 6. Section of a *nemathecium.* 7. Filament from the same:—*all more or less highly magnified.*





W. H. H. del et lith.

Reeve, Benham & Reeve imp.

PLATE CLXXXVIII.

CALLITHAMNION TETRICUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; stem either opake and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external tetraspores, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*), from καλος, *beautiful*, and θαμνιον, a *little shrub*.

CALLITHAMNION *tetricum*; rigid, shrubby; stem and branches robust, densely covered with ramuli, shaggy below, plumulate above; plumules crowded, quadrifarious, simply pinnate; pinnæ acute, tapering to the base, erecto-patent; articulations twice or thrice as long as broad; tetraspores elliptical, minute, sessile on short lateral processes of the pinnæ.

CALLITHAMNION tetricum, *Ag. Sp. Alg.* vol. ii. p. 179. *Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Harv. in Mack. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 141. *Endl. 3rd Suppl.* p. 34.

PHLEBOTHAMNION tetricum, *Kütz. Phyc. Gen.* p. 374.

CONFERVA tetrica, *Dillw.* t. 81. *E. Bot.* t. 1915.

HAB. On the perpendicular faces of rocks within tide marks, from half-tide level to low-water mark. Perennial. Summer. Common on the shores of the south of England and south and west of Ireland; less frequent on the east coast. Lambay, *Mr. Mc' Calla.* Channel Islands.

GEOGR. DISTR. Northern coasts of France, common.

DESCR. *Root*, a large disc, densely covered with interwoven fibres. *Fronds* two to eight inches long, or more, tufted, fruticose; *stems* as thick, or twice as thick as pack-thread, much branched, the branches long, and either simple or again divided, alternate, spreading on all sides, and densely clothed with shaggy or hair-like, coarse, irregularly divided ramuli, so that the divisions of the frond have the appearance of rough ropes; upper and younger divisions clothed with longer and more slender branchlets, which bear alternate spreading plumules: similar plumules spring from all parts of the shaggy branches, growing among the irregular ramuli. *Plumules* long and narrow, simply pinnate, straight; pinnæ erecto-patent, tapering to an acute point, and much narrowed at base. *Articulations* about twice as long as broad, somewhat constricted at the dissepiments. *Tetraspores* two or three together, elliptical, minute, sessile on the inner faces of short ramuli, which issue from the sides of the pinnæ. *Favellæ* binate, borne on the pinnæ (frequently shortened) of less regular plumules. *Colour* a very dark, dull, brownish red. *Substance* rigid, not very closely adhering to paper, soon decaying in fresh water after the plant has been once dried, and then exhaling the odour of violets.

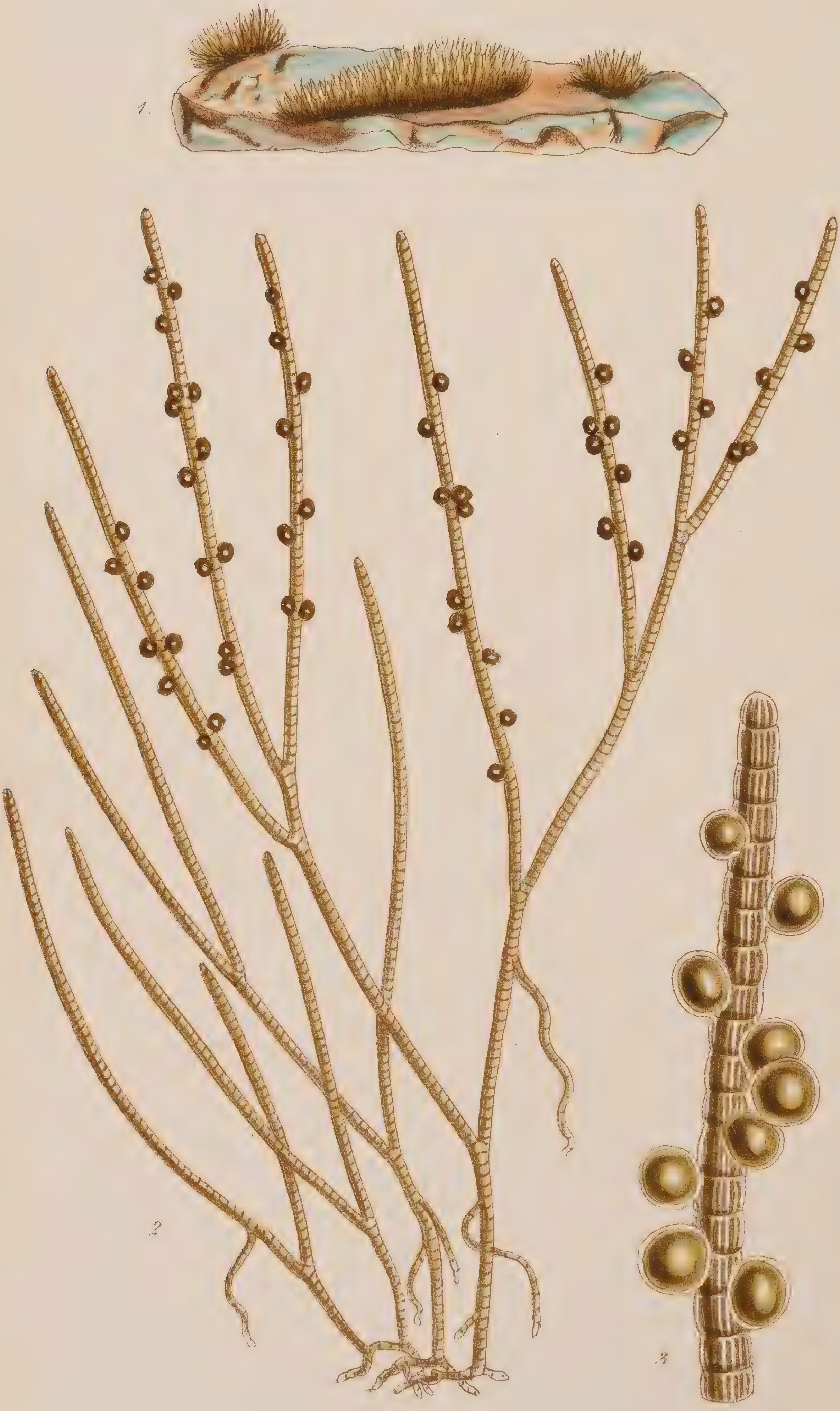
This is the coarsest of the British *Callithamnia*, resembling, in its bushy habit, shaggy tufts of *Sphacelaria scoparia*, and is often of a very dark brown colour, with little trace of the purple endochrome characteristic of the genus. At other times, much more shaggy specimens with a brighter colour are found, and some of these resemble large specimens of *C. Borreri*. Specimens collected at various seasons and from different localities differ much in the abundance and regularity of the plumules, as well as in the greater or less development of the hair-like ramuli. There are always, however, characters to be found quite sufficient to separate *C. tetricum* from any British species.

Mr. Dillwyn was the first author to notice this species, having found it abundantly in the neighbourhood of Swansea. He states that it is found generally in pools left by the tide, attached either to rocks or parasitical on Algæ. I have more commonly found it on the perpendicular faces of rocks which are left bare at low water, either perfectly exposed or shaded by hanging fronds of *Fucus serratus* and *nodosus*. In such situations, on the west of Ireland, it may often be found covering large spaces of rock, and growing luxuriantly.

None of our British species are very closely related to *C. tetricum*, but it is interesting to find in the *C. hirtum* of Auckland Islands, and *C. scoparium* of the Falklands, its southern analogues, resembling it in many respects, but readily distinguishable by obvious characters.

Fig. 1. CALLITHAMNION TETRICUM, tufts:—*of the natural size*. 2. Portion of an upper branch:—*slightly magnified*. 3. A plumule with tetraspores. 4. Ramulus from the same. 5. A plumule with favellæ:—*more highly magnified*.

Plate CLXXXIX.



W. H. H. del et lith.

Reeve, Benham & Reeve, imp

PLATE CLXXXIX.

SPHACELARIA RADICANS, *Harv.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles* (or *spores*) furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφακελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *radicans*; filaments erect, or decumbent, sending out a few fibrous radicles from the lower part, sparingly branched; branches alternate, simple, very erect, straight, bare of ramuli; utricles clustered, sessile, globose.

SPHACELARIA radicans, *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39. *Wyatt, Alg. Danm.* no. 210.

SPHACELARIA cirrhosa, ζ simplex, *Ag. Sp. Alg.* vol. ii. p. 29.

SPHACELARIA olivacea, *Ag. Sp. Alg.* vol. ii. p. 30. *Harv. in Hook. Br. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39. *Kütz. Phyc. Gen.* p. 292. *Endl. 3rd Suppl.* p. 24.

CONFERVA radicans, *Dillw. Supp.* p. 57. t. C. *E. Bot.* t. 2138.

CONFERVA olivacea, *Dillw. Sup.* p. 57. t. C. *E. Bot.* t. 2172. *Hook. Fl. Scot.* part 2. p. 83.

HAB. On sand-covered rocks, between tide marks. Perennial? Autumn. Rare. Bantry, *Miss Hutchins.* Dunmore, Waterford, *Miss A. Taylor.* Orkney, *Messrs. Hooker and Borrer.* Appin, *Capt. Carmichael.* Torbay, *Mrs. Griffiths.* Ilfracombe, Land's End, and Mount's Bay, *Mr. Ralfs.*

GEOGR. DISTR. Iceland. Baltic Sea. Heligoland, *Binder*! Coast of France, *Chauvin*!

DESCR. *Root*, decumbent, irregularly branched fibres, matted together. *Filaments* capillary, from half an inch to an inch in length, erect, or decumbent, forming dense, irregular tufts spreading over the rocks in patches of various extent, seldom fastigiate; generally, owing to the unequal height of the filaments, having a ragged appearance. *Branches* few, irregular, either alternate or secund, straight, simple, very erect, destitute of ramuli, but frequently emitting root-like fibres from their lower part, articulated throughout. *Articulations* rather shorter than the diameter, longitudinally striate. *Apices* obtuse, seldom sphacelate. *Utricles*, or *spores*, abundantly produced along the sides of the upper branches, globose, scattered or clustered together, sessile, with a narrow pellucid border, and containing a dark sporaceous mass. *Colour* a dull greenish olive, preserved in drying. *Substance* rigid, rather harsh, not adhering (or but very slightly) to paper, dull, and without gloss.

A minute species, one of the least developed of the genuine members of the genus, and more remarkable for its rarity than its beauty. It was originally discovered in the neighbourhood of Bantry, by the late Miss Hutchins, and first described and figured in the appendix to Dillwyn's *Confervæ*. About the same time specimens slightly differing in character, were gathered in Orkney by Messrs. Hooker and Borrer, and received the name of *olivacea*: and thus two species have generally been recognised. A careful comparison of the characters attributed to each, with an examination of specimens from several localities, has satisfied me that the differences do not warrant the retention of two species, and I consequently here unite the *S. olivacea* of authors, to the older *S. radicans*. The form to which the name *olivacea* was given, is rather more erect, and less disposed to throw out radicles than common; but there are no other characters by which it can be distinguished. I speak of the *S. olivacea* of British authors; the plant so called by Lyngbye appears to be somewhat different, and is either a distinct species or a state of *S. cirrhosa*.

Fig. 1. Tufts of SPHACELARIA RADICANS:—*of the natural size*. 2. Filaments:—*magnified*. 3. Apex of a fertile branch:—*more highly magnified*.